THE

AMERICAN GAS-LIGHT JOURNAL.

THE OFFICIAL GAZETTE OF

LIGHT, HEAT, WATER-SUPPLY, AND SEWERAGE.

Rooms—No. 39 Nassau Street, cor. Liberty Street, opposite the Post-Office, New York.

VOL. IV.—No. 76. NEW-YORK, MONDAY, FEBRUARY 16, 1863. $3 PER ANNUM.

REPORTS OF GAS-LIGHT COMPANIES.

ST. LOUIS, MO.

FIFTEENTH ANNUAL REPORT OF THE DIRECTORS TO THE STOCKHOLDERS OF THE ST. LOUIS GAS-LIGHT COMPANY.

The last annual report of the Directors noticed a decrease in the sale of gas to our customers, from causes that are familiar to you all.

That decrease continued, in a lesser ratio, during the first nine months of the present year, when it ceased. Since that time, owing partially to the rise in price of oil and other articles used for illuminating purposes, the consumption of gas has increased; so that, during the last three months, and at the present time, the consumption is increasing. Still the sales show a decrease of about 2,000,000 feet as compared with the previous year; also a decrease in the number of private consumers of 464, leaving the present number of private consumers 4,900.

The number of public lamps is 1,703; but by direction and agreement with the city, 53 of these are not at present used, leaving 1,650 now lighted and used.

The reports of the Superintendent and Engineer show the situation of the station works, street mains, and meter and service accounts. These accounts have varied but little in the aggregate during the past year.

The real estate has been increased $3,000 00 during the past year, by the payment of that sum to two parties in final settlement of an old claim, and now stands $112,743 33.

There are on hand at the present time 371,151 bushels of coal; an amount sufficient to carry on the works for a year, provided the supply was cut off by ice or low water.

As the business of the company has every prospect of paying the usual dividend to the stockholders, the directors have thought best to increase the salaries and wages of its employees to something like what they were before the reduction of last year.

The Sinking Fund for bonds due July 1st, 1865, is now $78,135 14.

The directors have paid the United States tax on the manufacture and sale of gas, without availing themselves of the privilege of collecting the same from the consumers, which the law gave us permission to do. The amount, it is estimated, will be from $12,000 to $15,000 per year.

They hope that the stockholders will approve of their action in the matter.

Should adverse circumstances require it, the new board of directors can collec the tax; but we trust they will not have occasion to do so.

The board have, during the past year, made the following donations:

For the relief of the families of soldiers....	$1,000 00
For organizing and arming the enrolled militia.....	200 00
For the Sanitary Commission.....	100 00

For more particular information we would refer you to the reports of the different officers which accompany this.

All of which is respectfully submitted.

JOHN TILDEN,
OLIVER A. HART,
JOHN D. COALTER,
Committee.

ENGINEER'S REPORT.

To the President and Directors of the St. Louis Gas-Light Company:

GENTLEMEN,—In accordance with custom, your Engineer respectfully presents for your consideration the following statement of the condition and operation of the station works under his charge, for the year ending November 30th, 1862.

During the year just closed, our operations so nearly correspond, in every respect, to last year's working, that a report from me appears almost a matter of form rather than interest.

I have no enlargements or alterations to report. The works are in good condition, and have ample capacity for a much greater production of gas than is at present required—except the condensers, for which the Board of Directors last year passed a resolution, authorizing me to replace them with others of larger capacity, to correspond in size with the other machinery of the works; but, owing to the stringency of the times, and a small diminution in the consumption of gas, by and with the consent of the president of the company, they have not been put up this year. But the time has now come when prudence and economy require the change.

During the year, the amount of coal carbonized for gas-making has been 23,634,400 lbs., or 315,448 bushels, of 75 lbs. to the bushels. The amount of gas made, 102,452,000 cubic feet, being 4¼ cubic feet to every pound of coal used. The amount of lime used for purifying the above gas, 9,200 bushels.

Amount of coke made during the year, 481,413 bushels; and the amount used for all purposes, at the works, 307,451 bushels; the amount sold, 173,962 bushels.

The greatest amount of gas sent from the works in 24 hours during the year, was 488,980 feet, and the greatest amount made, 411,000 feet.

By referring to last year's report, you will see that at the close of the year I was working 57 retorts. I am now working 62, with still increased confidence in the clay retort. I have now in use 24 retorts that have worked 40 to 41 months. At last report we had 40 retorts on hand; since, we have received 28 and used 12, leaving now on hand 56. Of brick, tile, and clay, our stock is about the same as last reported, so that for the coming year but little will be required for repairs in the gas-making department.

For report of stock, tools, &c., see inventory and monthly report. Respectfully submitted.

THOMAS PRATT, *Engineer.*

INSPECTOR'S REPORT.

To the President and Directors of the St. Louis Gas-Light Company:

GENTLEMEN,—The table headed "METERS SET AND RETURNED," shows an aggregate of 590 meters set during the year; also, 1,054 returned; making a decrease of 464, which deducted from 5,364, (the number at the commencement of the year,) leaves 4,900 meters now in use by consumers.

At the commencement of the past year the company had a stock of 632 meters on hand; adding 464, which has accumulated since, makes the number now on hand 1,096.

I intimated in my last Annual Report, that many of those meters were in a very decayed condition, and unfit for use; I have, consequently, laid aside as unserviceable 169, leaving a stock of 927 as fit for use at the commencement of the present year.

I am sorry to have to report adversely about the glycerine fluid, on trial in the wet meters. It answered admirably as regards its qualities for not freezing or evaporating; but on opening about 36 meters, in which it had been used for two years, I found nearly one-half of them with the internal cylinders quite destroyed.

The number of services laid during the year was 74.

Street Mains Laid.	Feet
Three-inch pipe along north side of Washington avenue from west side of Sixth street to west side of Seventh street.....	330
Two-inch pipe along east side of Thirteenth street, from south side of Olive street, northwardly.....	168
Total length added.....	498

Making a total length of 53 miles, 3,865 feet and 10 inches of street mains.

Respectfully submitted.

A. LARGUE, *Inspector.*

REPORT OF SUPERINTENDENT OF PUBLIC LAMPS.

To the President and Directors of the St. Louis Gas-Light Company:

GENTLEMEN,—You will find, in the table headed "LIGHTING AND EXTINGUISHING," the changes that have taken place in my department of the public lamps during the year 1862. For the first time, I have to note that there has been no increase in the number of public lamps; but, instead of that, there has been 50 suspended by request of the Mayor of St. Louis.

In my last report, I informed you that I had reduced the expenses of my department in every way, so that I had hopes that I would be able to bring them inside of the receipts; and I find I have done so. But, in the coming year, I fear it will not be the case, for the reason that the long continuance of the war has increased the price of every thing so much that we will have to increase the pay of the men to the old rates.

I may here state, that the suspending of the fifty lamps, before mentioned, did not decrease the amount of labor in lighting and extinguishing, in consequence of their being taken off in different parts of the city, so that the men had to pass them, leaving the distance they had to run just the same; but it has decreased the receipts without decreasing the expenses; therefore, I have the same number of men employed as at the close of last year, viz: 35, (10 cleaners, and 25 lighters,) at $30 and $8 per month, respectively. The pay roll amounts to $586 83.

Respectfully submitted.

C. E. DUNN,
Supt. of Public Lamps.

STREET MAINS, PUBLIC LAMPS, METER AND SERVICE.

Street Mains.

Balance, Nov. 30, 1861.....		$306,272 28
Hauling.....	10 00	
Labor.....	86 50	
Castings.....	78 75	
		175 25
		306,447 53
Pipe sold.....	252 55	
Re-laying a main pipe.....	338 11	
Laying mains for sundry persons.....	353 40	
		944 06
		$305,503 47

Public Lamps.

Balance, Nov. 30, 1861.....	$35,719 67
Lamp-posts and hauling.....	53 35
	35,773 02
Lamp-posts and lamps sold.....	48 00
	$35,725 02

Meter and Service.

Balance, Nov. 30, 1861		$55,113 23
Labor	469 35	
Tubing	245 07	
Cocks	171 22	
Transportation	35 52	
Lumber and nails	30 75	
Castings	12 70	
Boring, drilling and hauling	4 40	
		969 01
		56,082 24
Meters sold	9 00	
Meters destroyed at fires	55 00	
Services laid	2,024 75	
		2,088 75
		$58,993 49

Sinking Fund.

Balance, Nov. 30, 1861	$45,400 00
2½ per cent. of the earnings, May 31, 1862	15,000 00
2½ " " " Nov. 30, 1862	15,000 00
Interest received	2,735 14
	$78,135 14

Real Estate.

Balance, Nov. 30, 1861	$109,743 33
Interest of Jno. F. Darby in the Provonchere claim	1,500 00
Interest of Louis A. LaBeaume in Provonchere claim	1,500 00
	$112,743 33

LIGHTING AND EXTINGUISHING.

	Lamps put up.	Suspended.	Replaced.	Glass broken	Hours burned.
December	....	....	....	138	129¾
January	....	1	....	120	274¾
February	....	....	1	67	187¾
March	....	....	....	182	214¾
April	....	....	1	94	199¼
May	....	50	1	130	157¾
June	....	....	....	137	145
July	....	1	....	131	149¼
August	....	....	....	130	157
September	....	....	....	135	177¾
October	....	1	....	170	169¼
November	....	1	....	165	207¾
Total	....	54	3	1599	2196

Present number lamps	1,703
Suspended	53
Now burning	1,650

METERS SET AND RETURNED.

SIZES	SET. 2	3	5	10	20	30	45	60	80	TOTAL	SERVICE LAID.	RETURNED. 2	3	5	10	20	30	45	60	80	TOTAL
1861—December	17	44	22	4	....	....	....	....	....	87	12	35	64	14	5	1	....	....	....	....	119
1861—January	18	25	7	4	....	....	....	....	....	54	4	24	54	17	3	....	1	....	....	....	99
February	15	18	11	....	....	....	....	....	....	44	7	24	25	15	1	....	1	....	....	....	66
March	15	25	12	1	....	....	....	....	....	53	6	18	27	8	2	1	....	....	....	....	56
April	12	10	11	2	1	1	....	....	....	37	23	49	65	18	9	2	1	....	....	....	144
May	8	20	8	2	2	....	....	....	....	40	1	28	54	16	1	1	....	....	....	....	100
June	8	11	4	1	....	....	....	....	....	24	0	141	153	34	10	1	....	....	1	....	340
July	8	16	3	....	....	....	....	1	....	28	1	14	12	6	2	....	....	....	....	....	34
August	7	11	3	2	....	....	....	....	....	23	5	4	12	4	....	1	....	....	1	....	22
September	10	12	3	2	1	....	....	....	....	28	3	4	9	6	3	....	....	....	....	....	22
October	27	37	15	5	1	....	....	....	....	85	7	9	11	5	3	....	....	....	....	....	28
November	27	33	20	6	1	....	....	....	....	87	5	5	13	2	2	2	....	....	....	....	24
Total	172	262	119	29	6	1	....	1	....	590	74	355	499	145	41	9	3	....	2	....	1054

Coal, Gas, &c.

DATE.	Coal received. BUSHELS.	Coal used. BUSHELS.	Lime used. BUSHELS.	Coke used. BUSHELS.	Coke sold. BUSHELS.	Tar sold. BBLS.	Gas made. CUBIC FEET.	Gas left the works. CUBIC FEET.	Gas lost. CUBIC FEET.	Public lamps. AD. TOTAL.	Burn'g of public lamps. HOURS.	Gas consumed by public lamps. CUBIC FEET.
1861—Nov. 30	364,560	.....	.....	.....	.....	.....	493,212	.....	.....	1,703	.....	.....
December	.....	34,642	1,000	37,303	16,004	118	11,771,000	11,536,204	1,900,000		229¾	2,149,400
1862—January	.....	33,304	1,050	33,600	18,046	150	11,676,000	11,843,552	1,500,000		274¾	2,566,500
February	.....	28,841	900	26,981	17,128	71	9,107,000	8,896,568	900,000		187¾	1,754,100
March	.....	29,391	800	31,573	12,568	173	9,502,000	9,457,670	2,000,000		214¾	2,009,000
April	87,920	25,886	750	24,304	14,525	290	8,335,000	8,374,286	1,300,000	None added during the year.	199¼	1,869,800
May	130,092	21,329	600	20,925	11,568	217	7,039,000	7,202,847	1,700,000		157¾	1,481,900
June	84,680	19,203	600	18,000	10,309	253	6,295,000	6,432,419	1,700,000		145	1,318,200
July	23,234	19,192	600	18,532	9,544	407	5,859,000	6,193,472	1,900,000		149¾	1,356,200
August	.....	21,729	650	19,684	14,369	256	6,875,000	6,219,748	2,000,000		157	1,426,500
September	.....	20,798	600	22,344	12,454	327	6,565,000	7,057,278	1,900,000		177¾	1,612,700
October	.....	30,331	850	23,920	19,015	346	9,201,000	8,999,080	3,400,000		196¾	1,605,300
November	.....	34,698	800	30,282	18,432	389	10,227,000	10,316,326	2,000,000		207¾	1,712,900
	690,495	319,344	9,200	307,451	173,962	2,997	102,945,212	102,529,450	22,200,000	1,703	2296¾	20,812,500

Coal on hand, Nov. 30, 1862 ..... 371,151 bushels.
Gas on hand, Nov. 30, 1862 ..... 415,761 cubic feet.

NOTE.—5,357 bushels of the Coal under the head of "Used," in Sept., Oct. and Nov., was *sold*.

STATEMENT, *showing the Annual progress of the* ST. LOUIS GAS-WORKS, *from their commencement, in* 1847, *to* 1862, *inclusive.*

YEARS. November 30.	No. of private consumers.	No. of private burners.	Tot'l consumption of gas.	No. of public lamps.	Public consumption of gas.	PIPE LAID. Miles.	Feet.	Inch.	Stockholders.
1848	459	3,839	6,630,451	279	3,483,750	10	972	8	73
1849	789	5,572	13,301,482	358	3,736,651	14	63	6	87
1850	958	6,525	21,499,230	439	4,951,445	15	2,863	0	116
1851	1,362	9,540	28,256,046	678	6,885,063	24	1,798	0	151
1852	1,775	12,487	36,035,697	1,052	10,419,487	32	1,499	0	176
1853	2,191	15,509	42,942,222	1,107	11,739,775	34	1,505	0	182
1854	2,704	19,396	47,412,632	1,210	11,752,072	36	2,063	0	208
1855	3,096	22,953	51,929,242	1,359	14,105,530	41	158	0	215
1856	3,425	26,514	63,277,942	1,408	16,184,250	43	1,260	0	218
1857	3,857	31,829	74,616,472	1,522	17,208,200	45	3,354	0	220
1858	4,385	37,073	88,961,724	1,540	17,891,091	46	1,487	0	215
1859	5,091	41,684	102,145,920	1,568	19,105,000	47	5,012	4	203
1860	5,764	52,857	113,605,240	1,692	19,161,989	53	527	10	199
1861	5,364	.....	105,005,912	1,703	20,393,900	53	3,367	10	199
1862	4,900	.....	102,529 450	1,703	20,812,500	53	3,865	10	196

OFFICERS OF THE ST. LOUIS GAS-LIGHT COMPANY, FOR THE YEAR 1863.

Directors:

ASA WILGUS, OLIVER A. HART, CHAS. H. PECK, R. J. LOCKWOOD, JOHN D. COALTER, BENJAMIN STICKNEY, JAMES SMITH, JOHN TILDEN, LOUIS A. LA BEAUME.

ASA WILGUS.....President.
EDWARD STAGG.....Secretary.
THOMAS PRATT.....Engineer.
ALEXANDER LARGUE.....Inspector.
CHAS. E. DUNN.....Sup. Pub. Lamps.

KEY CITY GAS-LIGHT COMPANY OF DUBUQUE, IOWA.

SEMI-ANNUAL STATEMENT OF THE KEY CITY GAS-LIGHT COMPANY.—DECEMBER 31ST, 1862.

Assets.

Gas-works	$50,000 00
Coal account	2,292 26
Wages "	1,993 00
Lime "	113 50
Expense and repair	705 91
Two benches clay retorts	1,000 00
Station Meter	300 00
Julien C	511 19
Sundry accounts	414 13
Surplus	2,961 79
	$60,291 78

Liabilities.

Capital stock	$50,000 00
Receipts for gas	7,655 16
Tar, coke and mdse	2,217 77
Due to J. K. Graves	418 85
Other indebtedness	None.
	$60,291 78

At a meeting of the Board of Directors, held Jan. 10, 1863, it was, on motion,

Resolved, That a semi-annual dividend of three per cent. be, and the same is hereby declared, payable free of government tax, on demand.

The clay retorts alluded to in above statement were purchased of Elliman Bros., New York, and are much admired; we think them superior to iron retorts.

Our station meter we procured of Messrs. Code, Hopper & Co., Philadelphia—it has given good satisfaction.

We have but 275 gas consumers—are adding to the number constantly, however. Our city has not taken gas since '57, but we believe she will contract for the lighting of street lamps by another season. We have about seven miles of mains, and capacity sufficient to increase our receipts 400 per cent., and hope, at no distant period, to find an equal number of gas consumers. We are using the "third vein" Lasalle coal which we find to be a very fair article for gas purposes.

We have assumed the government tax on gas.

Very respectfully,
C. H. BOOTH, *President.*
J. K. GRAVES, *Sec. and Treas'r.*
J. B. HOWARD, *Superintendant*
Dubuque, January 12th, 1863.

NORTHERN LIBERTIES, PHILADELPHIA, PA.

ANNUAL REPORT OF THE NORTHERN LIBERTIES GAS-WORKS.

By the annual report of the Northern Liberties Gas-Works, for the year 1862, we find that the receipts and disbursements for the year have been as follows:

Receipts.

From sale of gas	$102,495 74
From sale of coke, tar, &c	5,210 27
Total	$107,706 01

Expenditures.

For works, as per last report	$178,037 42
During 1862	98 00
	$178,135 42
Mains, as per last report	62,675 67
During 1862	254 72
	62,930 39
Services, as per last quarter	47,464 36
During 1862	553 02
	48,017 38
Meters, as per last report	40,992 24
During 1862	1,399 70
	42,391 94
Real estate, as per last report	30,140 17
Ground rents	1,866 66
	32,006 83
Total	$363,481 96
For coals on hand at commencement, and received during the year	42,655 13
Wages, taxes, repairs, &c	30,611 14
	$73,266 27

The Trustees, in their report, refer to the continued efficiency attending their labors in providing consumers with a character and quality of light at once the most agreeable and economical, and bear testimony to the highly satisfactory condition of the works. The Company, however, has not escaped the manifold troubles of the country at the present time. The regular operations of the railroads have been materially interfered with, and from this cause arose the nonfulfillment of contracts for coal, disturbing the arrangements of the Company, by compelling them to use coal not considered the most desirable, either in power of illumination or yield, when the mines hitherto affording supplies were open to the best selections, and the usual channels of transportation were free from obstacles. An early remedy is promised for the evil. When this is afforded, the chief complaint of the Company will be removed.

WHAT IS COAL?

A correspondent of the *West Briton*, referring to Mr. Robert Hunt's lecture at Redruth, England, on coal says:

"With reference to the question—What is coal? perhaps you may not consider it out of place to call the observant attention of persons interested in Mr. Hunt's lecture to the 'lake of mineral pitch' existing in the island of Trinidad, and ask if it is not possible to trace a connection between that singular black deposit and the origin of coal? If we may take the words 'lake' and 'pitch' in their usual acceptation, the one implies a surface of considerable extent, and the other an inflammable consistent body resembling inspissated tar, —two qualifications that seem to suggest and maintain the supposition that if the dark-hued lake, in some mighty throe of nature, had been buried, like the doomed cities of Herculaneum and Pompeii, the course of time in the cavernous laboratories of the earth would have transformed it into a 'coal-field,' and its black contents into the substance all England is so prosperously and happily acquainted with. Leaning favorably to the idea that the remarkable Lake of Trinidad—and by analogy countless others of the antediluvian period, long since submerged for the benefit of mankind—had something to do with the coal formations, if not their actual progenitors, other evidences will be found to strengthen the position, which by their congenial testimony simplify and elucidate what must otherwise remain inexplicable and puzzling phenomena. The lake, with the exception that it holds pitch instead of water, might pass for one of the Cumberland district, embellished with tropical scenery; and the traveller, in describing his walk over it on a warm day, says his shoes adhered to the surface with a glutinous tenacity, leaving the footmarks of his track visible behind him; that the lake bore upon it a green islet, and that the banks surrounded the whole with a circling margin of verdure common to hot climates. With these materials, and the lake like black sealing-wax, warm and yielding, ready to receive impressions from every object about it—leaves, sticks, and stones—we can all understand on a windy day how the surface of the lake might be strewn with refuse, and imprinted and stamped with the actual fac-similes of all the plants of the vicinity; that the royal palm and graceful fern would give their sign-manual, and every other tribe of plants growing near would add to their testimony to the same, as the indelible bond marked for all time; while we can also readily perceive how any wandering, thoughtless reptile venturing across the viscid surface, might stick by the way; and becoming inextricably fixed, have his fate *sealed* in a living tomb, 'potted for posterity,' to be afterwards exhumed and shown to wondering multitudes, as the Exhibition frog! All these settlements of a remote age seem plain enough, as the preparations for a vast catastrophe; and when the time came for the great change—the transformation scene, and the lake, and all surrounding objects, with its luxuriant tropical scenery, descended, it would go down unrecorded and unseen to its destined place in the world's geological history, 'signed, sealed, and delivered' by Nature's great but mute authorities, to be heated by subterranean secret processes, and after being acted on by corroding mineral fumes and acids, solidified by pressure and stony secretions, to be in a future and historic age discovered, and its treasure-trove of invaluable stores disclosed to view, the providential dowry of the British Isles."

Oil Creek Railroad.—The Oil Creek Railroad, on which ground was broken in May last, and over which cars passed in October from Corry to Titusville, twenty-seven miles, is in progress of extension from Titusville down Oil Creek to Oil City, a distance, we believe, of sixteen miles, beyond which point it is to be continued down the Allegheny river to Franklin, twenty-seven miles from Titusville and fifty-four miles from Corry. This will make the Oil Creek Railroad Company the owners of fifty-four miles of railroad, from the mouth of French Creek at Franklin, up the Allegheny to Oil Creek, thence up Oil Creek beyond the oil wells, and thence to Corry, whence a wide gauge route is open to Jersey City, and a narrow gauge will be opened to Philadelphia.—*Cincinnati Gazette.*

HISTORY OF WATER-GAS.

(*Concluded from page* 227.)

In our last issue we gave an account of the experiments of Dr. Fyfe in making gas by the hydrocarbon process, in which it was shown that the process possessed no value whatever. These experiments being so much at variance with those of Dr. Frankland, the latter determined upon instituting a new examination.

The following report of the new experiments we take from Muspratt's admirable work on Chemistry Applied to Manufactures:

For some months after the publication of Dr. Fyfe's trials, Dr. Frankland was residing on the Continent; and, for a long period after his return, the want of a suitable apparatus, and the little time at his disposal for such matters, prevented a repetition of the experiments upon Boghead cannel, in order to determine the accuracy or fallacy of former conclusions.

The appearance of another article, however, on the same subject, by Dr. Fyfe, in the *Journal of Gas-lighting*, for March, 1854, confirmatory of his previous results, determined Dr. Frankland at once to institute experiments, with an apparatus in which the total quantity of gas could be operated upon.

The apparatus employed consisted of a cannel retort of the same size as that used in former experiments, surrounded by four water retorts, each of the same length as the cannel retorts, and nine inches in diameter, furnished with a diaphragm in the usual manner. The gas passed from the retorts through the hydraulic tubular condenser, and small wet and dry lime purifiers, to a station-meter, and thence to the holder, where the whole quantity produced in each case was received.

Although two hours were considered amply sufficient for complete intermixture and diffusion of the gases in such a holder, yet an interval of twenty-four hours was in each case allowed to elapse before the gas was submitted to the photometrical experiments. In thus using a large holder, it is indispensable that the gas for the illuminating room should be drawn directly from the water itself, and not from the large outlet-pipe, the unknown contents of which would, in many cases, supply a burner for several hours. This was effected by attaching a flexible tube to an aperture in the crown of the holder, and then conducting the gas to the illuminating room by a half-inch iron pipe. In this manner, a fair sample of the gas in the holder was secured. In all the experiments, the modification of Bunsen's photometer, by Messrs. Church and Mann, was employed. The gas was consumed in fish-tail and Winfield burners; and, in every instance, the determination was made when the gas appeared to be burning to the best advantage. The numbers obtained were, as usual, corrected to the one hundred and twenty grain candle standard.

Having previously ascertained that Boghead cannel, when distilled alone, yields considerably higher results in small quantities, and being desirous of placing the cannel in the best possible position for a comparison, only half a hundredweight was used for each experiment, in place of one hundredweight, as employed in previous trials. In making the hydrocarbon Boghead gas, the evolution of water gas was so managed, that the mixture of gases generated throughout the entire working was maintained at a nearly uniform illuminating power. To do this, the generation of water gas must at first be very rapid, and should nearly cease at the end of the second hour. The heat was a good bright red; and, in the trial with Boghead alone, it was slightly higher than in that with Boghead and water.

The following results were obtained:

I.—BOGHEAD WITHOUT WATER GAS.

Cannel used....Fifty-six pounds.
Gas produced...Three hundred and sixty-four cubic feet.
Time occupied..Two hours and forty-five minutes.
Gas per ton.....Fourteen thousand five hundred and sixty cubic ft.

ILLUMINATING POWER OF GAS.

Two cubic feet per hour, fish-tail No. 1.	Three cubic feet per hour, fish-tail No. 2.	Four cubic feet per hour, fish-tail No. 3.	Five cubic feet per hour, Winfield's burner.
Candles.	Candles.	Candles.	Candles.
14.7	25.5	36.4	48.9

ILLUMINATING POWER OF ONE CUBIC FOOT OF GAS.

Candles.	Candles.	Candles.	Candles.
7.35	8.5	9.1	9.78

Illuminating power of total gas, when burnt at the rate of three cubic feet feet per hour, = 3994 sperm candles, each sperm candle burning ten hours, at the rate of one hundred and twenty grains per hour.

II.—BOGHEAD WITH WATER GAS.

Cannel used...Fifty-six pounds.
Gas produced..Nine hundred and four cubic feet.
Time occupied..Two hours and forty-five minutes.
Gas per ton....Thirty-six thousand one hundred and sixty cubic ft.

ILLUMINATING POWER OF GAS.

Two cubic feet per hour, fish-tail No. 1.	Three cubic feet per hour, fish-tail No. 2.	Four cubic feet per hour, fish-tail No. 3.	Five cubic feet per hour, Winfield's burner.
Candles.	Candles.	Candles.	Candles.
11·1	19·0	26·9	48·1

ILLUMINATING POWER OF ONE CUBIC FOOT OF GAS.

Candles.	Candles.	Candles.	Candles.
5.55	6.33	6.72	8.0

Illuminating power of total gas, when burnt at the rate of three feet per hour, = 572.5 candles. Hence, gain in illuminating power by employment of water gas, per ton, = 10,524 candles; 85.0 per cent. Gain in quantity of gas, = 21,600 cubic feet; 175.9 per cent.

These results, therefore, most satisfactorily confirm those obtained in former experiments, *videlicet:*

	Per Ton. 1st Experiment.	2d Experiment.
Gain in illuminating power by employment of water gas	10,020 candles.	9,348 candles.
Gain in quantity of gas	24,920 cubic feet.	38,480 cubic feet.
	Per Cent. 1st Experiment.	2d Experiment.
Gain in illuminating power by employment of water gas	88.4	82.4
Gain in quantity of gas	188.2	290.6

Thus showing that experiments, in which a certain percentage only of the total gas generated is operated upon, are worthy of full reliance if conducted with the neccessary precautions; but, in order that the results may be recived with the same confidence, Frankland admits that this method requires more faith in the manipulatory skill of the operator than the other; for, as Dr. Fyfe has shown, it is easy to commit very serious errors if the neccessary precautions be not attended to. The essentials to accuracy are—first, that the tube supplying the small holder from the main should be as short and narrow as practicable; secondly, the gas should be admitted into the small holder *continuously* throughout the entire working, and not in isolated portions at stated periods; and, thirdly, the sample thus taken should not bear too small a proportion to the total quantity of gas generated. In Frankland's former experiments all these conditions were secured; but in the trial quoted by Dr. Fyfe, in which the sample collected in the small holder was thirty-three per cent. worse than it ought to have been, they were disregarded. In Dr. Fyfe's experiments, the capacity of the inlet-pipe was one hundred and thirty-two cubic inches, the gas was received in isolated portions at stated periods, and the sample thus collected bore a relation to the total gas of only 1:500. In Frankland's experiments, the contents of the inlet-pipe were only eighty-three cubic inches; the sample was collected continuously, and in the three experiments on Boghead cannel, it bore relation to the total gas:

First Experiment	1 : 83
Second Experiment	1 : 23.8
Third Experiment	1 : 32 3

These considerations clearly point to the causes of the discrepancy observed by Dr. Fyfe in his small percentage sample; and as the results of Frankland's second series of experiments, made with all the precaution which Dr. Fyfe considers necessary to accuracy, coincide closely, as seen above, with those he already published,—the actual gain of light per ton, ten thousand five hundred and twenty-four sperm candles, being somewhat greater than the mean of the first series, nine thousand six hundred and eighty-eight, and the percentage gain eighty-five,—it now only remains to show the cause of the discordance between Dr. Fyfe's experiments and his—the one assigned by Dr. Fyfe, viz., the use of a percentage sample, being completely disproved.

In pointing out what Frankland conceives to be the true cause of the discordance, attention will principally be confined to Dr. Fyfe's last experiments, in which he used retorts of the customary size; because Frankland is convinced that no results obtained with such a small apparatus, and such minute charges of cannel as those used in his first experiments, can be relied upon for comparison with experiments on a manufacturing scale. He feels also less reluctance in leaving these experiments out of consideration, since Dr. Fyfe himself admits, to a certain extent, that they were made upon too small a scale to be depended upon. For the hydrocarbon process especially, retorts of such small *longitudinal* dimensions are peculiarly unfitted; because the amount of carbonic acid generated in the

water retort is greatly augmented by diminishing the length of charcoal surface over which the water gas has to travel, and, for the same reason, a great excess of steam is also very liable to pass into the coal retorts, thus damaging the luminiferous constituents there generated. In addition to this cause of error, the experiments in question must have been much vitiated by the rapid carbonization of the very small quantity of cannel used, nearly the whole of the gas from which would certainly be expelled in thirty minutes—a length of time far too short for the generation of the requisite quantity of water gas from one small retort.

In Dr. Fyfe's last experiments, he used two retorts of a large size, one containing the charcoal or coke by which the water was decomposed, the other the coal, of which two hundredweight were used in each charge. Two charges were worked off, both with water gas, and the gaseous products received in a large holder. The average of these trials was twenty-seven thousand cubic feet per ton, yielding light equal to 2830.15 pounds of sperm. Dr. Fyfe then compares this result with that which he obtained by working the seven pound charges above alluded to, and thus shows a loss of thirteen per cent. by the hydrocarbon process.

The two principal points, in which the conclusions drawn by Dr. Fyfe from these results differ from Frankland's, are—first, his high estimate of the powers of the Boghead cannel distilled alone; and, secondly, the comparatively low results which he obtained by the collateral use of water gas. The first of these points arises, as just mentioned, from reliance being placed upon certain results obtained in small retorts with seven pound charges of cannel, which results differ most widely from those of all other experiments, as also from the previously published report of Dr. Fyfe himself.

To determine the influence of small charges in increasing the yield and the illuminating power of the gas from Boghead cannel, Frankland put 2.5 ounces of the same sample as that used in his last experiments in a hand glass tube; it gave 1.88 cubic feet of gas, five feet per hour of which yielded a light equal to 64.5 candles. These numbers are equivalent to fifteen thousand four hundred and eighty-two cubic feet per ton, or 3423.7 pounds of sperm per ton—a result which even exceeds that of Dr. Fyfe, and shows how little dependence can be placed in experiments upon small quantities of this cannel.

It is, therefore, greatly to be regretted, that Dr. Fyfe did not, at the time of making his last experiment at Leith, try a corresponding one with Boghead cannel alone in the same apparatus, instead of continuing to quote the results of his former trials on the small scale, which he admits to be unworthy of full confidence. Had he done so, Frankland feels assured that he would have removed one cause of discrepancy —*videlicet*, his estimate of the value of Boghead cannel when distilled alone, which, as proved, is far too high.

Dr. Frankland acknowledges himself indebted to Mr. A. Wright and Mr. T. G. Barlow of London, and to Mr. A. King, of Liverpool, for some very important information on this subject—the first gentleman having tested the value of the Boghead cannel during several weeks' working on a very large scale, and the latter two having made a very extensive series of most careful experiments upon a small scale. In Mr. Wright's experiment, three parts of Newcastle coal—Dean's Primrose—and one part of Boghead cannel, were distilled in separate retorts, yielding nine thousand five hundred cubic feet per ton; the mixed gases were burnt in a Number 2 fish-tail burner, 2.5 feet per hour giving light equal to thirteen candles. From this result of the mixed gases, the value of the Boghead was calculated to be 5.44 times that of an equal weight of the Newcastle coal; and therefore, taking the well-known value of Newcastle coal at nine thousand feet per ton—five feet per hour = thirteen candles, it follows that a flame of Boghead gas burning five feet per hour would give a light equal to 57.9 candles, at which rate of consumption the total gas from one ton of Boghead would be equal to 2182.1 pounds of sperm. Mr. King's result is the average of eleven experiments, each made upon the one-thousandth of a ton; the gas was burnt by a Number 1 fish-tail burner, at rates of consumption varying from 1.38 to 2.04 feet per hour. The value assigned by Mr. Barlow to Boghead is the average of three experiments, which were also made upon the one-thousandth of a ton of cannel, the gas having been burnt at the rate of from 1.44 to 1.92 feet per hour. If, in the experiments of Mr. King and Mr. Barlow, the gases had been burnt at higher rates of consumption, there is no doubt that the equivalent of sperm per ton would have been somewhat higher. In addition to this valuable evidence from gentlemen so intimately acquainted with the subject, there is also the statement of the owners of the cannel, contained in their advertisement, which appears monthly. Frankland considers this statement as good evidence on one side of the question, inasmuch as it is not usual for merchants to underrate the value of the commodities they have to sell. These estimates, along with that contained in Dr. Fyfe's printed report to the owners of the coal, are now appended with Frankland's results:

ESTIMATES OF THE VALUE OF BOGHEAD CANNEL.

Authority.	Cubic feet of gas per ton.	Gas from one ton = 16 sperm.
Mr. Wright	11,000	2182.1 pounds.
Mr. Barlow	13 344	2657 0 "
Mr. King	13,549	1993.6 "
Dr. Fyfe	14,800	2282.2 "
Advertisement of proprietors of Boghead cannel	13,500	1967.1 "
Dr. Frankland's 1st experiment	13.240	2387.7 "
Dr. Frankland's 2d experiment	14.560	2441.1 "

The above are by no means selected; they include all the experiments upon this cannel, with the exception of the subsequent ones by Dr. Fyfe, to which allusion has already been made. It will be seen from this statement that Frankland's results are considerably higher than those of any other experimenter. This is ascribed to the use of a diaphragm retort, and he believes that it is impossible to obtain numbers so high as his in retorts of the ordinary construction. The relation of these numbers to those employed by Dr. Fyfe for comparison with his experiments on the hydrocarbon process—namely, Dr. Fyfe's results with seven pound charges, 16,093 cubic feet of gas per ton; gas from one ton = 3253.5 pounds sperm—must convince every candid mind that his results are far too high, and cannot fairly be quoted for comparison with any experiments on the hydrocarbon process.

Having thus obtained a basis of experimental results for comparison with those yielded by the same cannel when treated according to the hydrocarbon process, Frankland proceeds to show the gain in illuminating power which that method exhibits, when the experiments upon it by Dr. Fyfe and himself are compared with these several results; for Dr. Fyfe rightly contends that it is to this test, and not to that of gain in quantity of gas only, that the hydrocarbon process must be submitted.

The comparison which Frankland formerly published, as well as the one previously cited, were founded upon equal consumptions of the respective gases; but Dr. Fyfe prefers to burn each gas to the best advantage, with a given burner—generally a Winfield—at high rates of consumption, and then to calculate the value of each cubic foot. By this method, the comparison may be said to be nearly that of equal light, instead of equal consumpts. Frankland and Fyfe agree on this point, and think that the basis of comparison, especially in gases differing much in richness, ought to be that of equal lights and not of equal consumpts. By adopting this plan in the following comparisons, the former has been compelled, in the case of his second experiment, to calculate the hourly consumption of a flame giving a light equal to about fifty candles, as he made no experiment beyond twenty candles. A consumption of ten feet per hour in a Winfield's burner is estimated as being equal to the light of 50.6 candles of one hundred and twenty grains per hour. He does not insist upon the absolute correctness of the gain exhibited by his second experiment, although he believes it to very near the truth:

These numbers prove, in the most incontestable manner, that there is invariably a very large gain by the employment of the hydrocarbon process, varying with the amount of water-gas used, and with the value at which the gas from Boghead alone is estimated. This gain is even apparent from Dr. Fyfe's own experiments, although its smallness, in comparison with that exhibited by Frankland's own trials, must strike every observer of the above table. The cause of this is, however, made clearly apparent when the mode in which Dr. Fyfe conducted his is taken into account.

Dr. Frankland has found that one water retort is incapable of generating more than one-half the amount of water-gas requisite for one hundredweight of Boghead cannel; and yet, notwithstanding this caution, Dr. Fyfe carbonized two hundred weight of cannel with only one water retort; the water-gas power was, therefore, only one-fourth of what it ought to have been, and, as might naturally be expected, the gain was only one-fourth of that which a properly-conducted experiment would yield. The Editor considers that Dr. Frankland has clearly demonstrated that there is a high gain in the total illuminating power obtainable from a given weight of Boghead cannel by the employment of the hydrocarbon process, and that his former estimate of that gain—at from eighty to ninety per cent. —was by no means too high. Since the publication of his first report on hydrocarbon cannel gas, he has had abundant opportunities of witnessing the working of the process; and although he admits that it is more liable to suffer from the carelessness of workmen than the old process, yet his confidence in its merits, and in its ultimate extensive adoption by gas engineers, continues in every respect unshaken.

CEMENT FOR FIRE CLAY RETORTS.—Muspratt recommends the following composition to be applied to cracks in clay retorts:

	Per cent.
Fire Clay	42.5
Loam Sand	42.5
Glass	10.00
Chloride of Sodium (common salt)	5.00
	100.00

This is to be ground well together with water, and applied when necessary.

PHILADELPHIA, PA.—At a recent meeting of the Philadelphia City Councils, an election was held for two trustees of the Philadelphia Gas-Works, which, as our readers are mostly aware, is a municipal concern. Messrs. Edward H. Trotter and John Manul, Republicans, were elected by a majority of *one*—a close vote. If the democratic candidates for trustees had been elected, it would have given that party a majority in the Board of Trustees, and we are informed that Mr. Samuel R. Brick would have been elected Chief Engineer, in place of John C. Cresson Esq., the present able incumbuet.

WATER RENTS IN PHILADELPHIA.—The water duplicates have prepared by the Register of Water, showing that in the year 1863 there is to be collected the sum of $563,429 75 as water rents.

The following table shows the amount of water rent to be paid by each ward in the city:

Wards.		*Wards.*	
First	$34,771 50	Thirteenth	$25,962 50
Second	26,408 25	Fourteenth	28,916 75
Third	16,629 75	Fifteenth	39,328 25
Fourth	17,474 00	Sixteenth	24,928 50
Fifth	27,255 50	Seventeenth	18,330 25
Sixth	32,175 75	Eighteenth	18,738 25
Seventh	32,032 75	Nineteenth	23,762 75
Eighth	39,797 25	Twentieth	37,054 25
Ninth	26,498 75	Twenty-first	350 00
Tenth	28,219 75	Twenty-third	364 25
Eleventh	16 929 25	Twenty-fourth	13,021 00
Twelfth	13,189 00	Twenty-fifth	4,377 50

PERCENTAGE GAIN IN ILLUMINATING POWER BY THE HYDROCARBON PROCESS AS APPLIED TO BOGHEAD CANNEL.

Name of Experimenter on Hydrocarbon Process.	Comparison with results obtained with Boghead Cannel alone, by				Proprietor of Boghead Cannel.	Dr. Frankland's First Experiment.	Dr. Frankland's Second Experiment.
	Mr. Wright.	Mr. King.	Dr. Fyfe.	Mr. Barlow.			
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Dr. Fyfe—experiment at Leith Gas-Works	29.7	42.0	24.0	37.6	43.9	18.5	15.9
Dr. Frankland's first experiment	89.6	107.5	81.2	101.1	110.3	73.3	69.5
Dr. Frankland's second experiment	105.6	125.0	96.5	118.1	128.1	87.9	83.8
Dr. Frankland's third experiment	127.7	149.2	117.6	141.5	152.6	108 1	103.6

PAPERS ON HYDRAULIC ENGINEERING.

By Samuel McElroy, C. E.

No. 3.—Pumping Engines.

[From the Journal of the Franklin Institute.]

(*Continued from page 213.*)

Engines.—The engines, as the second subdivision of our subject, may be specified in two general classes; the *single-acting*, or those which take steam in one direction for each double stroke, being returned by a counterweight; and the *double-acting*, or those which take steam in both directions.

Single-acting engines have vertical cylinders with the pumps beneath them, or beams, with the pumps under the outer end centres, the latter being the rule, the former the exception.

Double-acting engines may be vertical, inclined, or horizontal, with direct or with crank motions. Direct double-acting engines operate with and without beams (or half beams), the latter being the exceptions, and double-acting crank engines, operate with and without beams, the latter being the exceptions.

Single acting Engines.—In the single-acting mining engines, with beams, the steam stroke makes the suction lift of the several plunger pumps attached to the pump-shaft, and the suction and force lift of the lower bucket pump, the chief pumping stroke being made with the steam piston *in equilibrio*, by the weight of the descending pump shaft and attachments. In the water works engines, but one plunger pump is generally used, attached to a counterweight, the downward steam stroke making the suction lift. In the "Bull" engines, or those which act without beams, the steam stroke is upward, and also makes the suction lift. But in the Haarlem Meer single-acting beam engines with annular cylinders, the counterweight is lifted on the full steam stroke, the pumping lift being made on the return expansion stroke. These engines are therefore double acting as to the cylinders, in one sense, though entirely single-acting as to the several pumps, and as to distinct piston motion.

The engines of this general class, from their prominent rank, require somewhat particular notice, in which those used at the mines will illustrate the leading principles of operation, the water works engines being modifications of the same type. This notice will include their introduction, general and detail arrangement, and performance.

Introduction.—Watt erected his first engine in Cornwall, as an improvement on the engines of Smeaton, Hornblower, Newcomen, and Savery, about 1776, the first steam mining engine having been built about 1713. His prominent improvements included the condenser and air-pump, the expansion gear, the parallel motion, and the steam-jacket, with an improved workmanship and arrangement of details and arrangement of boilers, and have not been much modified since his day. About 1835, Thomas Wicksteed, Esq, Engineer of the East London Water Works Co., advocated the use of the Cornish Engine, and in 1837 the engine at the East Cornwall mines, near Callington, was taken down, altered, and re-erected at Old Ford for the Company. This was the first application of the single-acting beam engine to water works, an example extensively followed since that time. About 1790 several "Bull" engines were introduced in Cornwall, in which the cylinders were placed directly over the pump shafts.

General Arrangement.—In general, the boilers are placed in a separate house, connected with the engine house wall, and at a level below the cylinder base, for convenience in coal delivery, in taking steam, and working the steam jacket. The cylinder is housed in from the beam-centre, of which the supporting wall sustains the main pillow blocks, the air pump, condenser, and pump shaft being uncovered. In making the steam stroke, the engine is therefore said to "go in the house," in mining parlance. The cylinder foundation of solid stone work is built up several feet above the ordinary grade. The side pipes and valve gear are placed detween the cylinder and main centre so as to be worked by a plug rod from the beam. Great care is taken to enclose the steam pipes and cylinder with various devices to prevent radiation and condensation.

The peculiarities of the *cylinder* are the precautions for maintaining its heat by the steam-jacket, and by air spaces, brick-work, plastering, and lagging, in part or wholly used in addition. The steam-jacket is supplied by a special steam-pipe, and returns its condensed water to the boilers by gravitation. Its chief value is to prevent radiation and to compensate the effects of sudden changes of temperature from those of pressure in expanding, and the continued use of full steam at the upper end only; for low grades of expansion, its value is less apparent. The cover is made double and filled in with some non-conductor; the bottom also is double and supplied with steam—a practice which in the latter case is held objectionable in some instances from its effect on the exhaust. The stuffing-box has a steam packing chamber fed from the jacket to prevent the admission of air during the minus pressure in the cylinder at certain parts of the stroke—an ingenious and important arrangement. The piston-rod is so attached to the cross-head as to be free from it in one direction, in case the steam stroke from any accidental cause should charge the weighted beam with extraordinary momentum, which the spring beams might fail to sustain. These beams are placed above the cylinder so as to terminate the stroke in either direction when the piston does not itself come to its usual rest, catch-pins being placed on the beam for this purpose; a precaution of this kind is advisable, since the end centres or terminii of the stroke, are not controlled by a crank; but these engines admit so delicate an adjustment in operation, that the spring beams are safeguards rather than indispensable working parts to each stroke.

The *beam* is generally cast in two plates, bolted together with stub-blocks. Parallel rods are used for guides. It is generally centered so as to reduce the pump velocity in the ratio of 10 (piston) to 8 (pump). The improvements in forging and an assumption of increased safety, have induced the introduction of wrought iron beams, but in this case the large excess of weight used in these beams is overlooked—an excess of great consequence in engine inertia and momentum, which cannot be properly dispensed with.

The *valve motion* is controlled by a single or double plug-rod, from the beam, which is provided with tappets to operate the valve levers, and the cataract lever. The cataract is a very simple and beautful arrangement by which a small weighted pump plunger, when lifted by the rod, is regulated in its time of descent by throttling its discharge orifice, and opens the exhaust and steam valves for the return stroke by means of certain rods, levers, and cans, at a given point, thereby determining the number of strokes in a given time. This motion, as a whole, is effective and easily adjustable, but somewhat cumbrous and noisy, and is necessarily automatic, from the absence of eccentrics and rotary motions.

Four valves are used, all of which are of the double-beat or balanced form, viz: the governor valve which throttles the admission of steam to the steam chest, and works close to the steam-valve so as to prevent any material collection of steam at full pressure, between them; the steam-valve, which operates in the usual way; the exhaust valve, which opens in advance of the steam-valve at the base of the cylinder; and the equilibrium valve, which provides for the counterweight return stroke by connecting the lower side of the piston with the upper, so as to produce a balance of pressure. The lap and lead given this valve at will regulates the amount of cushion for the upper and lower piston stroke.

The double beat valve was introduced by Hornblower about 1800, and exerts an essential influence on the operation of the valve gear. The proportions of the steam and exhaust valves are also of great consequence, the former being made about one-fifth and the latter about one-forth of the cylinder diameter, the pipes being suitably enlarged.

The *condenser and air-pump* are about equal in size, the latter having half the engine stroke, and nearly half the cylinder bore. With its connections the condenser is about one-third the cylinder contents. In working, the injection is intermittent, being let on and closed with the exhaust, and the "hark" or pause between each stroke is claimed as an advantage to the vacuum. The air-pump, in addition to its foot-valve, has a floating cover as a delivery valve.

The *counterweight* is represented in these engines by the pump-rods and attachments which frequently have inclined lines of motion, and by the use of balance beams and bobs. A weight equivalent to the main pump load and all its frictions is, therefore, put in motion on the steam stroke, as the agent of the return stroke, as is also the case in the Bull engines, and in a less complicated manner in the water works engines. This stroke is therefore controlled and assisted by the inertia and momentum of these weights of the suction columns, and of the lower lift, (noticed under the appropriate head.)

In general arrangement, then, the salient points of the single-acting engine are found in its guards against radiation, condensation, and leakage; its simple and direct motions which reduce friction; its large valve openings, balanced valves, and automatic valve-gear; condensing apparatus; its weight in motion; and its careful workmanship.

Performance.—In operation the engine has these characteristics,—that all its motions are natural and deliberate, harmonizing with its work, both on the steam and equilbirium stroke; that the upper steam cushion is not wasted in power; that high initial pressure and moderate throttling is used, since the inertia of the mass to be overcome, and the time for transmission of impulse freely permit such initial force; that the subsequent *vis viva* of this mass, admits and requires a high range of expansion to prevent waste of power and concussions at the stroke-end; it is also, claimed as an advantage that the piston is independent of the pump column, and does not control its speed, although the experience of the Huelgoat, Haarlem Meer, Brooklyn, and other engines does not substantiate the claim, as a beneficial principle of action. In performance these engines, in use so many years and in large numbers, and of very large sizes, take rank of all others in mining and water-works on record. While their average duty is itself far in advance of that of other classes, individual cases range up to a formidable proportion, as we shall have occasion to show in the proper place.

A reference to the single-acting engine is important not only from its rank among pumping engines, but from its position in relation to all other steam-engines. The successful development of its principals of action, underlies all others, and it is impossible to analyze one class independently of the other. The history of the Cornish engine is the history of the steam-engine, however varied in arrangement, and one must be diligently studied to comprehend the various divisions of the other, since both are controlled by the same laws of maximum useful effect. This engine is then the true standard, as it is the pioneer also, of all others.

And from this basis of examination it is an interesting study to trace out the various ways in which these several principles of action, are vindicated amid seeming mechanical contradictions. Nothing apparently could be more dissimilar from this standard than a Mississippi engine coughing out steam at 180 and 200 pounds pressure, with its rude expansion gear, and yet it was in Cornwall that the economy of high steam was asserted and demonstrated through numerous trials, as well as the economy of expansion; if then, in Cornwall, it was shown that for a given range of pressure the condenser was an economy, the western waters have continued the demonstration of economy in connection with convenience by increase of pressure, and rejection of the condenser, simply showing a point where the advantage of condensation may be superseded by increased advantage in manufacture of steam and question of space. It may be held that the ordinary crank and fly-wheel engine is of a different class, but it agrees as to the admitted use of non-conductors, of balanced valves, of high pressure and expansion, of condensation, of weight in motion, differing chiefly in the arbitrary control of the piston exercised by the crank in reducing a certain reciprocating to rotary motion, and in the detail of valve-motion. Between the counterweight and the fly-wheel there is no difference in principle of action, as each has its distinct work to perform for each stroke. Certain necessities of application require a departure from the simple Cornish motion in various ways, as in combined and horizontal and geared rotary engines, &c., but the standared is never left without a loss in effect. In matters of detail the arrangement of vertical beam engines, the Americanism of balanced puppet valves, the parallel motions, floating air pump covers, boiler feed pumps, injection stands, piston form and packing, and other parts in common

practice with us, may be traced directly back eto thes past generations of experimental research, which in some particulars of this kind may yet be studied and copied with advantage.

That diversity of mechanical form may be consistent with mechanical principle, or in other words, that principles are superior to forms adapted to them, is also a matter of interesting research. The principle of non-conductors around steam vessels, does not necessarily involve the use of steam jackets, if by superheating or perfect clothing, the same useful effects may be obtained, and some inherent mechanical objections avoided; nor is the use of such devices peculiar to the single-acting engines which introduced them. This is true also, of perfect valve arrangement, and proportion of condenser and air-pump; of pressure and expansion; of inertia and *vis viva*, which may be equally useful and effective in double acting engines. The supremacy of principle being recognised, the subordinate questions of application become special and local, and what is chiefly important is, that principle should always take rank of detail.

The history of the Cornish engine is important in another respect, viz: in the examples it presents of various experimental devices, as modifications or assumed improvements of this standard. The Bull engine was an attempt at increased simplicity in one respect and to avoid a patent in another; it fails, however, from its imperfect application of the *vis viva*, and its consequent defects in taking steam and expansion. Hornblower, Wolfe, and Simms in their school, attempting an improvement in the method of expansion and steam travel by combined full steam and expansion cylinders, in which the pressures sometimes were varied as high as twenty to one, overlooked the law of inertia and *vis viva*, and encountered counteractions and serious frictional losses; so also, in the Boulton and Watt, and the various other forms of engines offered as substitutes, a formidable chapter of experiment demonstrates the value of correct, harmonious principle, for the instruction of all who choose to heed it.

Double-Acting Engines.—But engineers who comprehend and respect this supremacy of natural law, have also been impressed with the advantages which result from its application to double-acting pumping engines. The single-acting cylinder is open to these objections, as compared with the other,—that it must be not less than twice the size requisite for the same work in its proportions and appurtenances; that the beam and its bearings must sustain not less than twice the load; that the risks and effects of accidents, and the frictions are proportionally increased; that the air-chamber and some other parts must be doubly larger and stronger; that the outlay in capital is much greater, and in annual expense, also, to a certain extent; that the momentum of a weighted and balanced beam is preferable to that of a counterweighted beam, as to losses in excess of initial pressure and adjustments; that the *vis viva* of the force-lift pump column is lost to the steam stroke; and that the elastic steam stroke is better adapted for pumping than the non-elastic counterweight, and produces a better result with much higher and more controllable speed. And it has been reserved for an American engine, which ranks all other pumping engines in actual power, to demonstrate the correctness of adaptations of principle to this modification of form.

If, however, we examine the pumping engines of this country, which are double-acting as a class, in view of the principles enunciated, we find them at fault in several particulars. And first, in their general arrangement, as to the use of the crank.

Crank Motion.—It must be admitted without much study, that no change can be made from a reciprocal to a rotary motion, without doing violence to the conditions of motion, and it is also evident from a simple analysis, that the natural movement of a steam piston is inconsistent with the uniform revolution of a wheel or crank, on account of the relative spaces passed in a given time, and the relative variations of pressure and resistance due to each. We refer now to frictional and counteractive losses of power and not to the fallacy of any inherent loss of pressure.

In the elaborate theoretical demonstrations of crank motion which have been made from time to time, it will be observed that the element of mass in motion is neglected, but what is proper for a certain analytical purpose is not to be assumed correct for an investigation of useful effect, since such an element is indispensable to all engines in greater or less proportions. What, then, we have by pump cards, shown to be true of a mobile liquid, in its laws of initial and final motion, certainly cannot be less true of any homogeneous mass of metal, or of the working parts and load of any crank engine; and it is inevitable that there must be a certain initial and surplus impulse imparted to the mass which is felt throughout the stroke, and is compensated by its *vis viva*. After the time occupied in charging the load with this impulse, and from the time the impulse is properly communicated and has produced a maximum velocity, the natural law of piston motion involves a gradual reduction of speed. But the tendency of the crank and fly-wheel is towards uniform speed, and if this could be attained in practice, the piston would vary in speed in a manner entirely incompatible with its legitimate impulse or travel, being retarded where it ought to accelerate, and accelerated where it ought not to be. Hence result severe counteractions and frictions, which tend to reduce useful effect and embarrass proper operation. On one of the most carefully constructed crank engines, we have ever seen tested as to this loss, 23 per cent. was the lowest rate, as compared with the ordinary Cornish result of 10 per cent., and the Brooklyn engine of 7.4 per cent., while in the ordinary cases in practice, the loss easily reaches a much more serious effect from differences in workmanship. We may take it for granted then, that the use of the crank is to be avoided in all cases where the work permits it, and particularly in all pumping engines, from its arbitrary control of natural piston and pump motion without any compensating benefit. The idea that the terminal stroke and valve-motion may not be fully controlled without it is a mechanical error.

Radiation.—The general neglect of non-conducting protections for the cylinder and steam-pipes, has an injurious effect on engine duty. While a somewhat quixotic stress has been occasionally laid on cylinder condensation, without corresponding stress on radiation and their preventives, the lessons of correct practice require the proper application of the latter in the most simple and effective way. As to steam-jackets, we believe the Brooklyn engines are the only double-acting pumping engines in the country which use them, and as to the more ready application of felting, and other covering, there is a manifest room for improvement, which will quickly vindicate its value in useful effect.

Valves.—The use of balanced puppet valves is correct in principle, while slide valves are generally objectionable, from restricted openings, and increased valve load; nor can the importance of large openings be too strongly urged. Even with locomotive cylinders, which are necessarily small and used under high pressure, the best practice requires an opening of the full diametar of the piston, and what is true in principle in such a case, is equally applicable to larger cylinders under much less pressure. The severe losses in back-pressure to all cylinders are generally due to restricted exhaust. The losses of steam in the chests and clearance are frequently formidable, and deserve a careful attention. Those engine builders who bring their valves as close as possible to the cylinder ports, find by experience a benefit which is of great consequence. One important reason why long stroke engines are more economical and effective than the short stroke, is explained by the less frequent change of centres and corresponding savings in the clearance and steam chest. As to the working parts of the valve motion, it is a matter of little consequence to the cylinder how they are arranged, and they should be as simple and convenient as possible; "lap" and "lead" are of much greater consequence, and should be carefully adjusted by reference to indicator cards to the maximum effect. There are numerous varieties of expansion gear in use, which illustrate the difference between ingenuity and judgment, and are of unimportant choice, so that the steam-valve shuts at the proper moment, and its time of closing is adjustable conveniently.

Condensation.—The relative location, size, and arrangement of the condenser and air-pump, exert an important influence on their office. The vacuum formed by condensation is more or less imperfect from the percentage of air in the injection water, from uncondensed vapor, and imperceptible leakages; the friction of the exhaust passage may also increase back pressure; and a neglect of proportion in the air-pump may add a useless load to the engine, counteractive of effect. These parts should therefore be carefully adapted to their actual work, in proportion and workmanship, with regard to the precise office of each.

Problem of Useful Effect.—In pumping engines which are built to perform certain known work, and in which capacity is determined by size and speed, the problem of maximum useful effect may be adjusted from the pressure, expansion, and momentum, forming the important triad which controls it.

High Steam.—As to the manufacture of steam, it is a matter of simple demonstration, which may be omitted here, that it is cheaper to make it in a ratio progressive with its pressure, from the law of pressure and density, the standards of boiler radiation and other losses, the increased absorption of heat by water, and other natural and mechanical causes; but in ordinary boiler practice, and praticularly in condensing engines, there is a limit to pressure, which seems to be established by common consent, considerably below 100 pounds, (plus pressure.) In fact, the Cornish practice, from 45 to 75 pounds, is considered high in our pumping practice, and is erroneously rejected, except in the Western high pressure non-condensing engines. There can be no question of the superior economy of the Cornish process, which indicates a lesson to be followed in that respect.

Momentum.—With a given average pressure to provide for a given load, and proper initial pressure, which should not be throttled if it can be avoided, (although in badly proportioned engines throttling is much better than low boiler pressure,) the ratio of expansion acting in connection with the weight to be put in motion, assumes its proper rank in this problem of effect. Though it is manifest that the same average pressure will balance the same average load, and initial pressure and expansion might therefore be indefinitely increased with increasing gain, the conditions of momentum place a limit to this ratio, and indicate its range of practical usefulness.

Expansion.—The doctrine of maximum effect, depending as it does under these conditions, on engine momentum and expansion, makes it clear that either may be regulated so as to contrl or facilitate the other, and that the engine mass should be so adjusted, within reasonable limits, as to permit a suitable measure of expansion. To say that an engine works imperfectly from being too light, or to say that engine weight in motion is the true measure of its economy, involves a very deep and important meaning, which theory has demonstrated and practice confirmed for generations, although it is not often put in type. The *rationale* is not complicated;—it is necessary to obtain a given initial impulse in excess of the average resistance, that the moving parts and load should have sufficient inertia to prevent abrupt motion; this inertia, in fact, regulates the range of initial pressure, and when overcome by it, and a certain speed generated, the moment for cutting off is reached, and the reducing piston pressure is compensated by the generated *vis viva*, these jointly completing the stroke. The idea of uniform resistance or uniform pressure on any steam piston, is a mechanical myth, existing only in the abstruse regions of speculation; and in every case where an engine will not take steam without close throttling, or will not cut off short, it may be taken for granted that its proportions are at fault in this respect.

As to the usefulness of expansion, *per se*, which has been called in question, under circumstances amply discussed in former pages of this Journal, it may be said that if no other experience existed than that which the Cornish engine has put on record as to this particular, aside from the testimony of natural laws, and as a mear result in reducing annual expense, the correctness and propriety of its use, up to one-twentieth cut-off, is established beyond preadventure. In scores, and fifties, and hundreds, by tens, twenties, and fifties of years, the mining engines alone furnish proof enough on this subject, to establish a theory against all doubts, and all contradictory demonstrations. Cases of this kind furnish proof of the argument advanced in the outlet, that the lessons of the past cannot be safely

overlooked or neglected by the present, and that principles always vindicate themselves to the benefit or the cost of humanity.

Combined and Geared Engines.—Having briefly sketched the salient points of single and double acting engines, and their movements, in reference to leading principles, some allusion is due to the practice which obtains with the latter class, in some cases, of combined movements and transmitted power.

What has been shown in reference to combined pumps on the same force main, as a source of injurious counteractions, is equally applicable in spirit to any attempt to make two or more steam cylinders work exactly in harmony, when coupled to the same shaft or working parts of any kind. So long as resistances, in a steam engine, mainly determine pressure, it is impossible that two or more cylinders, taking steam at different times, and offering different pressures at the same time to a common resistance, should avoid mutual counteractions; one must alternately drag and carry the other, to an extent measured by the condition of each special application; each, in turn, must do more than its proper proportion of the work; and combined cylinders at sea and in locomotives, were introduced for the propose (among others, of convenience in arrangement, &c.) of keeping the engine off its crank-centre; an idea experience has sufficiently corrected aboard ship, and would also correct on the railway if tested. In all cases of combined cylinders, the power to be exerted by each, must be in excess of its due proportion to the legitimate aggregate work. Besides this plain principle of alternate action, in cases where no attempt is made to develop uniform power, the subdivision of engine work into several cylinders, involves a large increase of loss by clearances, leakage, radiation, friction of piston, valve gear, and other woking parts, for no good reason, whatever, in the attempt at uniform pumping speed, which is itself a demonstrated fallacy.

Without pausing here to specify cases in illustration, as we are now discussing generalities rather than details, it may be said in reference to all geared engines, and other means of power-transmi-sion between the steam and pump pistons, which depart from the simple arrangement of the Cornish engine, that they are defective precisely in the ratio of increased frictional resistance incurred in each special case, as also in quietness of action and other particulars.

And of this point in general it may be asserted, that as an attempt to alter the pumping motions of the standard engine, or to obtain double action at the expense of power, or to modify in any respect the salient features of the master type, for unimportant or subordinate conveniences, they are evidently open to serious objection, and prove it in their records of duty.

Summary.—Taking the single-acting engine as the standard of example and comparison, from its rank as to age, arrangement, and performance, in such manner as an article of this kind will permit, we have endeavored to present as a matter of principle for universal application, and independent of special and local demands, those peculiarities of its operation which seem to be most worthy of general adoption, and are defined by protection from power-waste, directness of motion, perfection of detail and workmanship, pressure, expansion, inertia, and condensation. The several points involved in this group of characteristics have been so presented in contrast or connection with our diversified school of engines, and with double-acting engines generally, as to furnish some pertinent basis of judgment on their merits in special cases, under the light of general rules.

Keeping the chapter of engines distinct from that of pumps, we have also avoided here any discussion of special illustrative examples, since the application may be easily made to each or all, and is not immediately involved under this investigation. In some future remarks on engine duty, special applications may be more properly made.

It may be also said, that the low standard of results in some examples of the Cornish school, are simply proofs of their failure, in some respect or other, in proper development of their inherent principles of action, and may be properly charged to incorrect design, construction, or management. This is a case where principles must be held independent of individual results, by which they are negatively vindicated.

(To be continued.)

GWYNNE'S WATER-GAS.

A few days since at the invitation of Mr. W. H. Gwynne of White Plains, N. Y., we proceeded to that town for the purpose of witnessing the trial of the process, about which so much has been said in the columns of this JOURNAL. The questionable success attending previous water-gas processes is well known, and it was with a certain degree of skepticism that we took charge of the works for a few hours, and noted the progress of the operation. The bench consisted of two square iron retorts with diaphragms. In the bottom of the water retort is laid the "distributor," which superheats the steam before it enters the retort, and then ejects it in a very finely divided state into and among the incandescent charcoal, by which it is at once decomposed. After leaving the distributor, the steam traverses the water retort, and then being thoroughly decomposed, the resulting gases are passed into the coal retort, where they meet the rich hydrocarbon vapor from the cannel coal and from permanent gases. We saw *one hundred and five* pounds of Ince Hall cannel coal put into the coal retort, and then noticed the registration of the station meter. In three hours 912 feet of gas was generated from this coal and steam only, and this gas, judging by the eye alone, was equal to any coal-gas we ever saw burnt. The quantity of tar made by this process is almost inappreciable. Mr. Gwynne has had his process in operation in White Plains for nearly a year, and the gas there gives great satisfaction to the consumers. The burners in use in the town are principally 4 feet. We understand the gas-works at Scranton, Pa., are about being adapted to use Gwynne's process, and it will be in operation there in a few weeks.

GAS CARBON FOR SMELTING IRON.—In the retorts which are employed in gas-works for the distillation of coal, a coating of very pure carbon—sometimes called graphine—gradually accumulates. It adheres to the surface of the metal and forms in thin scales. No other substance has been found equal to it for making the carbon points of electric lights. It has a metallic lustre, resembles black lead in appearance, and it makes marks upon paper similar to those of a plumbago pencil. Carbon is one of the most wonderful substances in nature. Under different conditions, it possesses diverse properties. In one state it is the brilliant diamond, prince of gems; in another it is black opaque coal. As plumbago, it is one of the most fractious of substances, it being used for crucibles in which iron may be melted without producing the least appearance of fusing it. How different are the properties of plumbago, which cannot be burned, and the coal which is employed to warm our houses and smelt the hardest of metals; and yet they are the same substance in a chemical sense. The carbon which forms on the interior of gas retorts, although it is very hard and greatly resembles plumbago, is quite different in its nature as it respects combustibility. At a high heat, it burns freely, and could it be obtained in sufficient quantities, it would surpass all other kinds of fuel for smelting iron. When used in cupola furnaces for smelting pig iron to be used for casting, three tuns of it will smelt as much iron as five tuns of common anthracite coal. Being so pure, none of the heat is absorbed—as is the case with anthracite—by ashes, and as a consequence a far more intense heat is generated in the furnace. Indeed, the heat obtained in a cupola furnace from gas carbon is so intense that it will fuse fire-bricks. It is well known that the quality of iron is greatly affected by the character of the coal that is employed to reduce it from the ore, or melt it in the pigs for casting. Very small quantities of sulphur and phosphorus in the coal and coke employed for smelting iron tend to render it brittle and deficient in tenacity. This is the reason why wood charcoal is so superior for smelting purposes. It contains neither sulphur nor phosphorus, while mineral coal always contains certain quantities of them. In Pittsburgh and the Ohio valley very great value is attached to those coal seams which contain the smallest amount of sulphur, because such coal produces the best iron when it is used for smelting. A discovery by which coke could be made from bituminous coal as cheaply and as pure as the graphine carbon in gas retorts would be a most valuable acquisition to the practical arts. Iron could be smelted with it at much less cost, and the quality of the metal would also be vastly improved by its use. Such a discovery should not be considered impossible, for this substance is derived from the very same coal that produces common coke. —*Scientific American.*

DEMOLITION OF THE SOHO MANUFACTORY.—The celebrated Soho Manufactory, at Birmingham, England, is about being torn down to make room for further improvements. This is the first large building in England ever lighted with gas by Mr. Murdoch, who has been justly styled the "father of gas-lighting," and was the scene of many of his experiments. It was also the work-shop of James Watt, the inventor of the steam-engine, and also of other distinguished inventors and engineers.

ILLUMINATING GAS PRODUCED DURING THE YEAR ENDING JUNE 1, 1860.

[From the U. S. Census, Preliminary Report.]

STATES AND TERRITORIES.	Number of establishments.	Capital invested in real and personal estate in the business.	Raw Material Used, Including Fuel.		Number of men employed.	Cost of labor.	Annual Products.	
			Tons of coal.	Val. of raw material.			Quantities in 1,000 feet.	Value, including coke.
Maine	10	$840,000	5,482	$41,865	59	$21,732	44,087	$143,852
New Hampshire	5	248,000	3,436	36,226	31	5,760	25,950	86,843
Vermont	2	106,000	570	4,600	7	2,640	2,824	15,215
Massachusetts	10	2,686,500	59,200	362,565	225	109,404	366,558	967 058
Rhode Island	4	792,600	8,383	62,218	64	22,320	68,450	197,735
Connecticut	8	566,000	14,664	56,473	53	20,196	70,338	232,054
Total in New England	39	5,239,100	91,735	563,942	439	182,052	578,232	1,642,757
New York	43	7,558,150	215,516	1,564,884	2,631	979,464	1,809,921	4,881,805
Pennsylvania	30	5,248,554	120,131	651,919	1,006	472,452	828,558	2,147,802
New Jersey	15	986,130	7,660	64,004	86	45,156	70,509	233,474
Delaware	2	177,200	1,520	10,500	12	5,220	12,800	33,175
Maryland	2	87,000	550	5,200	9	3,600	2,800	13,500
District of Columbia	2	6 2,000	10,500	52,625	168	4,800	77,764	242,388
Total in Middle States	94	14,669,134	355,877	2,349,132	3,912	1,510,692	2,802,437	7,558,144
Ohio	22	1,668,650	30 173	92,470	356	135,936	195,701	491,748
Indiana	7	388,850	6,470	24,426	49	23,772	36,628	96,012
Illinois	8	1,385,000	5,083	81,096	182	65,700	105,029	342,142
Wisconsin	4	169,000	.....	.....	.....	.....	30,000	94,176
Iowa	4	.....	.....	.....	.....	.....	12,900	55,900
Missouri	2	665,000	15,817	48,750	61	30,480	101,817	419,306
Kentucky	2	117,966	5,625	25,220	88	38,040	60,857	96,449
California	4	270,000	1,815	62,975	20	26,880	16,950	146,200
Total in Western States	55	4,485,466	64,483	334 987	756	320,808	559,882	1,741,933
Virginia	15	264,000	1,840	12,955	31	6,396	22,580	59,700
North Carolina	1	27,000	.....	788	3	900	674	4 046
Georgia	2	273,000	2,500	31 100	35	17,520	21,058	96,000
Alabama	1	125,000	3,000	22,000	20	21,600	13,218	58,000
Tennessee	1	200,000	.....	.....	25	13,200	16,000	63,800
Total in Southern States	20	889,000	7,340	66,843	114	59 616	73,530	281,546
Aggregate United States	206	25,282,700	519,435	3,314,854	5,221	2,073,168	4,014,081	11,224,380

THE AMERICAN GAS-LIGHT JOURNAL is published on the 1st and 15th of every month, and is the recognized official organ of

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Its purpose is to ascertain and make known all new discoveries in the science and economical application of LIGHT, and promote thereby the interests of companies and consumers; to encourage and aid the introduction of PURE WATER from Lakes and Rivers into Towns and Cities, and to improve the system of SEWERAGE, VENTILATION, HEATING, and DRAINAGE everywhere.

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☞ Remittances by mail to be addressed to the Editor,

C. ELTON BUCK,

ROOMS of the AMERICAN GAS-LIGHT JOURNAL,
No. 39 Nassau st., cor. of Liberty st., opposite the Post-Office.
New York City.

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THE
AMERICAN GAS-LIGHT JOURNAL,
PUBLISHED ON 1ST AND 15TH OF EVERY MONTH.

C. ELTON BUCK, ... EDITOR.

MONDAY, FEBRUARY 16, 1863.

Unless the details of the census returns of 1860, concerning the general manufacturing industry of the country are more correct than those referring to the manufacture of gas, they may be pronounced utterly valueless for any practical purposes. We have not critically examined the returns of any other branch of industry save that of the production of illuminating gas; but in this one branch alone are so many false estimates, such a culpable underrating of the proper extent of the art, and such a wide discrepancy between the tables published by the Census Bureau and the truth, that it demands some attention. In another part of this issue of the JOURNAL we publish the table taken from the preliminary report on the eighth census, which is condensed from the full report—not yet published—by JOSEPH C. G. KENNEDY, Esq., the Superintendent of the Bureau. This table purports to show the statistics of illuminating gas produced during the year ending June 1, 1860. On pages 22 and 23 of our second volume will be found our tables of gas-light companies in the United States. These tables, although published in the number of July 16, 1860, were compiled about the same time that the government's information was being obtained, and although dated six weeks later, the matter was all in the printer's hands by the 1st of June; consequently the tables are brought down to the same time, and although they were not compiled with exactly the same object in view, and the extent of their details varies, still they present some points which, when viewed together, exhibit the most culpable negligence on the part of those government officials whose business it was to collect reliable information.

In the first place, the official tables represent the total number of gas-works in the United States, in June, 1860, as being only 206 in number, while our tables, compiled at the same time, and from official sources, put the number at 381—a difference of *eighty-five per cent.* The tables of the Census Bureau represent the capital invested in the manufacture of gas at $25,282,700, while our tables name $47,911,215—a difference of *eighty-nine per cent.* Had we been told before examining the census tables, that such gross discrepancies as these existed between the government's returns and what we knew to be the true figures, we could hardly have believed it. It seems incredible that such reckless assertions should be made, and that such incompetency should have been shown by those servants of the government, whose duty it was to obtain the correct information. What guarantee have the people that the entire census report is not as far wrong? It would be quite as reasonable to characterize the whole of it as unreliable and false—judging by the specimen we have seen. But other errors in these same tables demand our attention. By reference to the recapitulation of our tables published at the foot of page 23, volume II., the number of gas-works in each State is shown. As some of our readers may not have these tables we will place the figures side by side:

STATES.	NUMBER OF GAS-WORKS.	
	According to our Tables.	*According to the Census Tables.*
Alabama	3	1
Arkansas	NONE	NONE
California	9	4
Connecticut	14	8
Delaware	3	2
District of Columbia	1	2
Florida	1	NONE
Georgia	6	2
Illinois	13	8
Indiana	7	7
Iowa	5	4
Kansas	1	NONE
Kentucky	5	2
Louisiana	2	NONE
Maine	10	10
Maryland	6	2
Massachusetts	49	10
Michigan	8	NONE
Minnesota	1	"
Mississippi	4	"
Missouri	4	2
New Hampshire	9	5
New Jersey	19	15
New York	71	43
North Carolina	8	1
Ohio	30	22
Oregon	1	NONE
Pennsylvania	48	30
Rhode Island	7	4
South Carolina	2	NONE
Tennessee	4	1
Texas	3	NONE
Vermont	8	2
Virginia	11	15
Wisconsin	8	4
Total	381	206

From a glance at the preceding figures it will be be seen that the census returns are correct in only three of the States. The States of Florida, Kansas, Louisiana, Michigan, Minnesota, Mississippi, Oregon, South Carolina and Texas, containing together 23 gas-works, are left out entirely, thus ignoring the existence of the important gas companies of Leavenworth, New Orleans, Detroit, St. Paul, and Charleston, whose aggregate capital amounts to $3,123,800, to say nothing of the capital of the gas-works in smaller towns in the omitted States. These omissions are wholly unpardonable; and they show a most culpable negligence on the part of the officials connected with the Census Bureau, for which there is no palliation, and not the shadow of an excuse. We presume that the fault lies with the local officers whose duty it was to gather the information necessary to complete the census. They have certainly shown a gross dereliction of duty, and with but few exceptions the whole of them deserve the maledictions of every student seeking reliable statistical information.

Our tables before referred to do not give the amount of coal carbonized. The table from the census report pretends to give this information. As a specimen of its correctness it may be mentioned, that Maryland is tabulated as using *five hundred and fifty tons of coal!*—we suppose this means per year. The officer whose duty it was to canvass the State of Maryland for this information was probably not aware of the existence of the city of Baltimore! The whole capital invested in the manufacture of gas in the State is set down as $87,000, while according to our statement, the capital stock of the Baltimore gas company alone is $550,000, or more than six times the amount returned by the census for the whole State! According to the same census report, the small State of Delaware is set down as having twice as much capital invested in the manufacture of gas than Maryland, and as using nearly three times as much coal. We venture to say that the Baltimore gas company alone uses 50,000 tons of coal per annum. We have mentioned Delaware, which according to the census table has $177,300 invested in the manufacture of gas. Our tables show that one town in Delaware, viz., Wilmington, has $200,000 capital invested in its gas-works. Again, the census table says that in the whole State of New York but 215,516 tons of coal are used annually in making gas. We may safely say that in the city of New York alone, more than 175,000 tons of coal are annually used. Assuming the census report to be correct, this would leave but 40,516 tons to be divided among the gas-works in the important cities of Albany, Brooklyn, Buffalo, Rochester, Schenectady, Syracuse, Utica, and the many other town and village works scattered throughout the State.

In view of these inexcusable blunders—these unpardonable misstatements—it is but natural to pronounce the tables relating to the manufacture of gas disgraceful to the Department under whose supervision they were prepared. If the remainder of the census returns are worthy of as little credence, the whole report is nothing but an abortion of the worst kind, and is not worthy of the slightest confidence. Indeed, it would have been far better to have made no attempt to publish any report, for total absence of information is better than such ridiculous and false statements as the gas tables contain.

BULL.

We have not yet done with Bull. Once an emigrant in this country, he has returned to his own, a self-elected oracle of all that pertains to us; and we need not say how utterly the Temple is belied by such an expounder of its mysteries.

The report of the Louisville, Ky. Gas-Light Company, printed in our last number, is a thorough and complete refutation of all that Bull has said of the necessity of our gas companies to raise their price of gas, in order to divide reasonable profits.

For the year ending Dec. 31, 1862, a year more trying to the city companies than any likely again to happen, owing to the very general depression in business, since recovered, its receipts were 134,889 13
its expenditures - - - - 53,657 60

leaving a net product of - - $81,231 53
nearly twenty per cent. upon its capital.

That this is owing in a great measure to the able and judicious management of Mr. R. G. COURTENAY, we admit, but in saying that, we but prove the assertion that where in one point there is an excess of expenditure to meet, in another there is a saving to be made; and here it is that the practised eye and intelligent mind of Mr. COURTENAY is to be seen. He manages his works with such skill that the vicissitudes of business are compensated by the advantages of his own experience and management.

Mr. COURTENAY's report is a model in its detail, arrangement and results. His company has had much to contend with in more ways than we can here explain, but by steady and firm control, by faithful protection of its interests, and courteous treatment of its opponents, he has guided it safely through years of litigation, and gained not only a complete financial victory, but the respect and confidence of his adversaries.

Will not Bull review Mr. COURTENAY's report in the application of his own prophecies? His deductions would be entertaining.

GAS NUISANCE.

To the Editors of the Evening Post:

Your correspondent "Pure Air," complaining of an offensive odor which permeates the dwellings,

&c., attributes it to the gas-works. In this he does the gas companies great injustice. This offensive odor comes from the sewers, and as the works have no connection with the public sewers the cause must be sought for elsewhere.

Your correspondent also says: "It is now attributed to the consumption of a poor quality of coal used to manufacture the present wretched gas, for which our citizens are paying the most exorbitant prices."

For our company I deny the truth of this statement. Better coal cannot be had than that which is used by the Manhattan Gas-Light Company—and there is no coal gas company in the United States which makes purer gas or gas of higher illuminating power. Your correspondent calls for an investigation. We court such an investigation, and only ask that it may be conducted by scientific men who are competent for the task, and in whose decision intelligent and upright men will have confidence.

Respectfully, your obedient servant,

CHARLES ROOME,
President Manhattan Gas-Light Company.

The above letter is in reply to the anonymous communication to the *Evening Post*, copied in our last number.

It is a matter of surprise that the President of the Manhattan Gas-Light Company should stoop to notice anonymous attacks; if he dignifies every cowardly assailant by a reply over his own signature, he will soon have a foe as numerous as the rebel army. A severe silence is the best reply to such persons.

ALLEGED IMPOSITIONS OF THE MANHATTAN GAS-LIGHT COMPANY.

BRADY'S GYMNASIUM,
No. 20 St. Mark's Place, Eighth street.

To the Editor of the New York Times:

Will you allow space in your valuable columns to expose one of the many thousand impositions practiced on the community by the Manhattan Gas-Light Company, in their removing a meter from my premises, and thereby putting me and members of my establishment to great inconvenience, and serious loss to my business, by depriving me for a time of the use of gas—after first compelling me to leave with them a deposit of $25—next, compelling me to pay the gas bills weekly, which I have promptly done, (said bills amounting weekly to from $5 to $6) and in face of all this, they sent a servant of theirs to remove the meter, said servant refusing to listen to any argument, or look at the receipted bills in my possession, and upon my applying to the Company for redress, all the satisfaction I could get was the insolent reply of the Vice-President: "*Why don't you pay your bills?*"

Can you inform me how long the consumers of gas and a liberal public are to be imposed upon by the imposition of this monster monopoly?

ABNER S. BRADY.

The Manhattan Gas Company seems to be always at the bar of public opinion. The circumstances of the above case appear to be as follows: One of the book-keepers of the gas company directed the meter-man to remove the meter from the premises No. 29 St. Mark's Place, because the tenant had not paid his gas bills.

The meter-man promptly obeyed his orders, but unluckily there were two meters in the house, one belonging to the defaulting tenant and the other to one Mr. Brady, the *paying* tenant, who appealed to the Company for an explanation. The Vice-President asked him, "Why don't you pay your gas bills?" and on Mr. Brady's persisting that he had always done so, the mistake was discovered. The poor meter-man was then dismissed for removing the wrong meter, although no fault of his, but he is poor and humble, and it is the misfortune of his position to suffer.

If justice were done by the Company the book-keeper should be instantly dismissed for not indicating whose and which meter was to be removed, and the poor meter-man restored to his position.

It is a general complaint that it is hardly possible to obtain a courteous answer to the most respectful complaint at the office of the Manhattan Gas-Light Company.

The poor fellow who has been victimized for a show of justice was the recipient of a dollar and a quarter per day, and was no more responsible for the error than was the President of the Company, nor, indeed, half as much so.

A NEW LIGHT.

On page 202 of this volume we noticed that Dr. G. H. Smith, of Rochester, N. Y., had invented a new light, or rather a new manner of producing the effect of the lime-light with coal-gas instead of hydrogen, and atmospheric air instead of oxygen. An exhibition of this light was given in this city a few evenings ago, which is thus described by a daily paper:

It is well known to all who have given attention to the subject, that if a more powrful form of light could be devised, equal in economy to that now in use, its application to the head-lights of locomotives, so as to give the engineer entire control over his train—a result impossible with any light at present in use—would be hailed as a great boon by the night taveling public. This valuable result has been attained by the experiments of Dr. George Hand Smith, of Rochester, by which, at the small cost of fifteen mills per hour. (the cost of the old oil light is six cents,) a light is produced of such exceeding briliancy and power as to illuminate in advance a long extent of track, making at once apparent to engineers dangerous obstructions, and insuring, as far as light can do so, the safety of the train.

The New York Central Railroad, under its present very able management, ever in the advance in valuable improvements, for rendering this great road perfect in all its details, appreciating the full merit of this invention, at once adopted it, and are rapidly supplying all of their locomotives.

This light belongs to that class, wherein a solid substance, such as pencil of lime, is rendered incandescent, or intensely luminous, by the concentrated heat of ignited jets of combined gases, of which the ox-hydrogen light is the type, where, as the name imports, the gases thus employed are oxygen and hydrogen. The power of this light is well known, and repeated efforts have been made in Europe, as well as in this country, to employ it for practical purposes. But the great expense of supplying the gases, particularly the oxygen, together with the rapid deterioration of the lime, has defeated these attempts. This employment of lime for purposes of illumination has attracted a large degree of attention abroad, from the extreme beauty of its light.

But, the difficulties mentioned, particularly the supply of the gases, have heretofore prevented its introduction. It is here that the newly dicovered method Dr. Smith applies—viz., the abundant supply of that greatest ingredient of artificial illumination, oxygen gas, literally without cost, by the employment of atmospheric air—carburetted hydrogen, as common gas, being substituted for hydrogen. The air contains one part of oxygen, and about three parts nitrogen gas. Hence it would require four parts of air to give the requisite amount of oxygen—*i. e.*, to obtain one foot of oxygen, four feet of air would be needed, as three of them would be nitrogen. Now, the great difficulty in n using arises from the fact (and this fact alone has prevented its adoption) that if we combine four parts of air and one of common gas, we have diluted the gas so largely as to prevent its readily burning. And what is still worse, if combustion were complete, the nitrogen not being combustible, would fly off unconsumed, and carry away the heat generated, to such a degree as to render the luminosity of the cylinder of lime of no practical value.

But if an amount of heat from any source is applied to the current of air previous to ignition, sufficient to supply the loss of heat from nitrogen at the time of combustion, no heat is lost upon the lime, and the whole power of the oxygen is obtained, as though no nitrogen were present. Also, the gas will be found to combine with a larger amount of hot air (and consequently oxygen) than with cold air. Hence, by supplying a current of pre-heated air to one of common gas ignited, an ample supply of oxygen is afforded, and all the heat generated is saved and concentrated upon the lime. This is the principal feature of this new method.

The burner devised for railway lights is composed of four compound jets, encircling a small cylinder of lime. A current of air and gas is conveyed to each jet, and by a simple device, the stream of air is heated before it reaches the jet.

The four-fold intensity of heat induces the dazzling whiteness of the lime peculiar to the ox-hydrogen light. When placed in the focus of a parabolic reflector, such as are in present use upon engines, it is increased to a ball of light twenty inches in diameter, or the eye of the mirror.

The flow of air and gas is reliably and simply controlled by suitable regulators and stop-cocks within the lamp. Two gas-holders placed under the engine communicating with the lamp by a small pipe for each, carry twice or thrice the requirements of a trip. These receive their charge at the engine-houses before starting. This is easily attended to by the local engineer. To fill the holders in each locomotive occupies its engineers only from three to four minutes—very much less time than is required for filling and trimming an oil-lamp. In short, the light is better, cheaper, cleaner, and more convenient than the old oil lamps.

The great and remarkable feature of this discovery is that a light of the most powerful character is produced almost enterely from *air*. This may be realized by stating that the Commissioners of the Central Park paid last winter for the ox-hydrogen light $1.60 per hour for each light, while the *air-light* of equal brilliancy is produced for a trifle over one cent. per hour.

The invention, it is believed, may be applied to all purposes for which gas illumination is at present required, even to the economical lighting of private dwellings, theatres, and public halls. The public will have future opportunities for viewing it.

ANSWERS TO CORRESPONDENTS.

G. M., of N. B.—*Your letter with enclosure was received, for which accept our thanks.*

E. B. C., of N. Y.—*We have seen the instruments you speak of, and consider them well adapted for tests where great accuracy is not indispensable.*

B. McM., of Mass.—*There is not a copy of the work to be had in this city. The present high rate of exchange will make it cost much more than it could be bought for formerly.*

J. E. C., of Pa.—*We have not heard the rumor you mention. It is undoubtedly untrue, as the last information we had concerning the company's affairs was favorable in the extreme, and their future prospects were spoken of as being unusually good.*

N. L. T., of Cal.—*We will make some inquiries about the matter, and report progress by an early mail. Would be pleased to receive the paper.*

J. S. & Co., of Minn.—*You will find the names of the proper parties to address in our advertising columns. They will promptly reply to any questions on the subject.*

CORRESPONDENCE.

ANOTHER "SICK MAN" IN DR. JEFFREY'S HANDS—DISEASE, DROPSY ON THE ROOF.

CINCINNATI, O., GAS-WORKS,
27th January, 1863.

To the Editor of the AMERICAN GAS-LIGHT JOURNAL:

I am obliged to you for bestowing on me the new title of Doctor in your last number, and beg to report another "*sick man*" in the shape of the wrought-iron roof of a coal-house belonging to the Cincinnati Gas Company, which fell two weeks ago, from the weight of snow, which laid about twenty inches deep; the lower part having fallen after warm rain, was compressed and full of moisture, so that, according to my calculation, there was a weight of snow on each superficial yard of about 100 lbs.; the roof measured 160x65 feet, and, therefore, was subject to a pressure of about 58 tons weight of snow. The frame of the roof was of round bars of iron, with right and left hand screws put into malleable iron sockets or knees, and was covered with corrugated sheet-iron. The roof was built five and a half years ago by R. H. Harris & Co., of Philadelphia, who took the contract, furnishing their own plans and specifications, and consequently no blame can be attached to the engineer of the Gas-Works here. The roof was a double pitch, resting on brick walls. The walls were uninjured by the fall of the roof.

Your obedt. servt.,

JOHN JEFFREY

PETROLEUM ITEMS.

ORIGIN OF PETROLEUM.—A correspondent of the *Scientific American* enlightens that paper with the following speculations as to the formation and origin of petroleum:

"I will now say a few words in regard to the formation of coal, from which comes the petroleum or rock oil. Coal is the product of a former vegetable world. By analysis we can determine the manner in which the vegetables were transformed into coal. Oak wood, for instance, is found to consist of carbon, 36 parts; hydrogen, 22 parts; and oxygen, 22 parts. Now, if we take the sawdust of oak wood, moisten it and place it in a closed vessel, carbonic acid gas is produced; the wood assumes a white color, and corresponds, if it is analyzed, to the white decayed wood found in the trunks of old trees. An analysis of this white decayed wood gives carbon, 33 parts; hydrogen, 27 parts; and oxygen, 24 parts. The elements of the water have united with the wood and carbonic acid gas has been evolved.

	C.	H.	O.
Thus, take wood.....	36	22	22
To this add five atoms of water....		5	5
And three atoms of oxygen.....			3
Then take from this three atoms of carbonic acid gas.....	36 3	27	30 6
	33	27	24

We then have the formula of decayed wood.

"The analysis of brown or wood coal (extensive beds of which are found where the woody fiber is so perfect that the annual rings can be counted) gives carbon, 33 parts; hydrogen, 21 parts; and oxygen, 16 parts.

	C.	H.	O.
Now if we take wood.....	36	22	22
And deduct one atom of hydrogen and three atoms of car. acid gas..	3	1	6
	33	21	16

We then have the formula for brown coal.

"The analysis of brown coal where the traces of woody fiber have nearly disappeared, such as is taken from great depths and is covered by thick layers of basalt, has been found upon analysis to consist of carbon, 32 parts; hydrogen, 15; and oxygen, 9; showing a further separation of the elements of carbonic acid gas and water. This process of the separation of the elements of carbonic acid gas and the elements of water is still going on; for in districts where large layers of brown coal exist, springs impregnated with carbonic acid gas abound.

"The composition of cannel and similar coal is found, by analysis, to be carbon, 24 parts; hydrogen, 13 parts; and oxygen, 1 part. Taking wood (C. 36, H. 22, O. 22), and deducting therefrom three atoms of carbureted hydrogen (C. 3, H. 6), three atoms of water (H. 3, O. 3), and nine atoms of carbonic acid gas (C. 9, O. 18), we have (C. 24, H. 13, O. 1) which is the formula for cannel coal.

"Now it is known that carburetted hydrogen is being generated wherever mineral coal exists in large beds in the earth, as well as carbonic acid and olefiant gas; for from the fissures in the coal strata and rocks of the coal formation, these gases are being constantly generated, producing fire-damps in mines and filling caves and fissures in the earth's strata, when condensed, with the petroleum or rock oil. It has been ascertained that these deposits of rock oil or petroleum are found generally in districts where the strata have been thrown up, causing caves and fissures, which are filled with the condensed vapors under pressure that are being constantly generated from the coal beds. Where the strata are sand-stone, the oil will be absorbed, and we shall have a bituminous sand-stone; where they are argillaceous, we shall have bituminous shales, bog-head coal, &c.; where the petroleum is hardened by heat, we shall have the asphaltum, Albert coal, &c.

"When we consider the vast extent of our coal-fields (nearly 100,000 square miles having already been surveyed), and that the process of condensing and hardening the softer coals is still going forward in the earth till they may, in the course of long ages, approximate the hard anthracite, we shall not incline to believe the supply of petroleum will soon be exhausted. From some study of the geology of the State of New York, I have been led to the conclusion that petroleum will be found in this State. It would hardly warrant individual enterprise to embark in the examinations and expenditures necessary to establish the fact. I think the State should make an appropriation, and appoint a scientific board or corps to make the examination.

"I have been induced to make the foregoing remarks in regard to the formation of coal and petroleum partly from some recent statements that have been made, that "petroleum was formed long before the coal, and is the result of the decomposition, under pressure, of an infinite number of oil-yielding animals, which swarmed in the seas of the Devonian period, long anterior to the coal."

In a succeeding number of the same paper the views of the writer are controverted. As this subject is one of some interest, and as the origin of petroleum is still clouded in numerous conflicting theories, we make room for the following remarks:

"In the paragraph explaining the chemical formula of the change or degradation from woody structure to coal, E. G. K. asserts that petroleum comes from coal. If he means that, in some other portion of the globe than the United States and Canada, petroleum may be the result of a chemical change from coal, we shall not take a "lance" against him; but in the North American continent it is not so. On the contrary, all the rock-oil which is of any economic value has its source in rock whose geological position is many thousand, probably not less than 5,000 feet below the coal-bearing strata. I do not mean to be understood that this great number of feet intervene between the oil-bearing strata and the coal-bearing at any one point, but that this is about the maximum thickness of the strata when measured in those localities where they are best developed.

"Again, in the last paragraph but one from the bottom in the middle column, he says that 'carbureted hydrogen, carbonic acid, and olefiant gas are being constantly generated wherever mineral coal exists in large beds, and when condensed produce petroleum.' We admit the formation of the gases, but deny that of petroleum as a geological fact. From the anthracite of Pennsylvania, through the soft coals of the same State, Virginia, Maryland, Ohio, Kentucky, Illinois, and Iowa, there are no petroleum springs in the coal—no signs of any such condensation, either now existing or ever having existed in previous ages. The coal comes from the mine as dry of oil as if no rock-oil were known in the world. Why should it not? The oil is the product of Dame Nature in her chemical laboratory from material (waste stock we once would have called it) produced millions of years, if not ages, before coal-plants had been created. (This remark relates to the Silurian and not Devonian strata. In the latter many lands plants have been found, 106 species in all, enough to show that there were large continental areas, and enough to form extensive beds of coal, but not in the region of the oil wells of North America.) It may be objected to this statement of fact of dry coal, that the oil has dripped through the intervening strata into the oil-bearing which lies below. To this we say that each coal bed has, immediately below it, a water-proof layer of clay, more or less thick, which must have held the oil if any had been formed. Again, in Ohio, Canada and Illinois, petroleum is found where no coal was ever made.

"One can sit down in a laboratory, fill his flask with bog-head, light his lamp, witness the vapors slowly rise through the neck, go over through the connecting glass tube with the condenser and from thence issue as oil. It is a very beautiful experiment, very convincing that oil is the product of coal in the laboratory, but not as a necessary consequence in nature. Nature and man work differently to accomplish the same ends. Man's method of producing oil from coal, which was once woody fiber, is by destructive distillation. Nature's method is to build up by living forces the elements of hydrogen, carbon, and nitrogen into organizations either of vegetable or animal, and then by degradation of the organism after death to bring forth these elements into new compounds and forms, not organic, for compounds are simpler than organisms. The Devonian seas swarmed with multitudes of organisms, both of vegetable and animal, much as the present seas do, if we may so judge from petrifactions in the rocks. Here was abundant material for the chemical degradation of structure into oil. The soft porous sandstones of Pennsylvania, the softer slates of Canada, and the open limestone of Chicago were the store-houses—the vats to hold the oil. The lard oil from Cincinnati as truly represents the organization of the hog as the lard, the ham, the bristles, or even the skeleton. Geologically, we would say, coal is the chemical product of the Carboniferous age, and oil is the chemical product of the Devonian age.

"In the latter part of the same paragraph the writer says 'the oil-springs are found in districts where the strata have been thrown up, causing caves and fissures, which are filled with the condensed vapors under pressure that are constantly being generated from the coal beds.' If the writer has visited the regions where oil is 'struck,' he has not read the origin of the valleys and hills with true geological eyes; and if he has not, this information as to the strata is wide of the truth. From the Adirondac mountains in Essex county, N. Y., travelling in a south-westerly direction to the city of Pittsburgh in Pennsylvania, one passes over all the rocks containing organic remains, from the early oceans stocked with life to the carboniferous continent producing land plants and consequently coal. In all that distance the rocks lie smoothly, not disturbed, gently dipping towards the south-west, never thrown up nor convulsed. The same can be said of Canada and all the north-west States containing coal. It is in the anthracite where the rocks have been thrown up; but there, who has ever 'struck oil?' The fact is, in New York State and Pennsylvania, to the north of the oil wells, the rock which yields the oil can be seen coming to the surface. In the city of Chicago it is quarried and builded into churches, when the prophecy is literally fulfilled, 'the rocks shall flow with oil.' The same can be done in Ohio, Virginia, and Canada. We shall arrive at truth when we leave speculations and confine ourselves to facts.

One kind of rock gives us magnetic ore, another dye-stone ore, another gold, another lead, another coal, and another oil. It is our business to ascertain which rock is the parent of its peculiar mineral, and not to speculate whether one may not be the product of another. The importance of this statement cannot be over-rated. If a man believes from theory that hematite ore is the decomposition of magnetic, he will spend his money vainly in searching in the primitive. Thousands of dollars have been thus lost. And if a man is led by theory to believe that oil is the educt of coal, he may be disappointed in boring and spend his money in vain. During the oil mania how many were thus disappointed! How many returned to their homes disbelievers in the science of geology and pronounced it all a humbug! Had they not humbugged themselves?

We have in the last paragraph of the same column a specimen of the same kind of reasoning from assumed premises and inferences from false theories. The writer says:—'The process of condensing and hardening the softer coals is still going on in the earth (over 100,000 square miles); in the ages to come it will approximate the anthracite; hence, the supply of petroleum will not soon be exhausted.' If the theory were correct, the inference would be true, of course, and oil-spring owners might take courage. But, suppose oil does *not* come from the condensation of coal. What then? Oil wells do fail; this is too apparent. They fail in Canada, in Ohio, in Virginia, in Pennsylvania—everywhere. Others may fail. It may not be true, even, that the softer coals are condensing. What then? Why, the whole theory falls to the ground, inferences and all."

While referring to this subject, we append the following extract from the *London Grocer*:

"The origin of the inflammable liquid oils known as petroleum has not at present been investigated with that degree of care which would enable a very decisive opinion to be pronounced as to the whole of the circumstances leading to the production of these valuable materials in the immense quantities in which they are produced.

"The oil-bearing strata have, however, been more attentively studied in Canada than in any other part of the world. Sir W. Logan, who has devoted much attention to the economic minerals of this country, describes the oil as being yielded by a limestone, formerly chiefly of fossil corals, in the pores of which the oil is stored, like honey in the cells of a honeycomb. When this limestone rock is quarried, the oil flows out, and floats on the surface of the water at the bottom of the quarry. It will give a good idea of the immense amount of this mineral wealth in Canada when it is stated that the oil bearing limestone underlies an area of 7,000 square miles in Western Canada alone.

"As may be inferred from the circumstance of its consisting largely of corals, this limestone is of marine origin, and contains the remains of no other than marine animals, so that we must conclude that these valuable hydrocarbon oils are derived from the decomposition of their soft, jelly-like flesh, precisely in the same manner as the decay of plants has, in other and later formations, given rise to bitumens and coal.

"With regard to the causes of the rise of the oil to the surface of the land when the limestone is bored into, it would seem that the petroleum springs of Canada are always in those situations where the limestone, beneath the surface, rises to a ridge, like the roof of a house, sloping away on either side; and as the subterranean water accumulates in the lower part of the porous stone, the oil by its superior lightness, floats on its surface, and is thus forced out of the fissures which exist in the ground along the line of the ridge, and an immense quantity of mingled oil and water is forced up when the deeper parts of the oil-bearing strata are perforated by the borer.

"So convinced are most persons that these oils are essential *mineral* productions, that the statement that they are in all probability of animal origin, may be as hard of belief as the fact that our coal is the remains of fossilised plants, although no facts in geology are more firmly established."

THE CANADA OIL SPRINGS.—The Toronto *Globe* says:

"The question most eagerly asked of persons just come from Enniskillen, is generally the all-important one of whether the wells are holding out or not. It is a fact that many of the flowing wells have ceased to flow; and others, while still continuing to flow, did no longer yield the immense quantities that they did at first. But then there remains yet untouched a large area of what there is every reason to believe to be good productive oil territory. The work of drilling and sinking wells is still vigorously carried on, and a rise in the price of crude oil to $1 or $2 per barrel would set the drills agoing at a rate hitherto unheard of. The owners of wells which have ceased to flow do not think it worth while to drill down any further until a more remunerative demand arises for crude oil. When this takes place, every effort will be made, both by drilling further and pumping, to bring the oil up, if there is any to bring. The question whether former flowing wells will yield oil by pumping, has yet to be determined."

We have mentioned in one of our late numbers the fact that an oil panic reigned at Oil Springs, C. W., in consequence of the sudden and almost total stoppage of the flowing wells at that place. The *Chronicle* in its review of the week ending January 22, says:

"Never before, perhaps, since rock oil in Enniskillen attracted the attention of the business public, has there been a fractional part of the anxiety and interest manifested in relation to the oil business that exist at present; and never before has occasion arisen for the manifestation of such feeling. The suddenness and unlooked-for character of the cause of this excitement has well nigh unhinged business here for the present, in the ordinary forms, and had the effect to stop many stills and refineries throughout the Province, for a time, in anticipation of bringing the price of crude oil down to something near what it was two weeks ago. But such an effort we look upon as abortive and weakly conceived. The supply is undoubtedly short, the demand already great, and increasing steadily and surely. Refiners who cannot afford to pay $3 per barrel for crude will do well to sell out to some one who can afford to pay that price, and make a handsome profit besides.

"Teams which, ten days ago, could hardly be procured for money, now modestly *ask* for employment. Shipments are not one-tenth what they were, so extremely tenacious of their oil are producers, and so excessively cautious and timid are buyers. Contracts for more than 100 barrels are difficult to obtain—in fact very little oil, except upon old contracts, is changing hands. Manipulators and consumers must have it, however, but they buy sparingly. Prices this week have ruled, $2.00, $2.50, and $3.00. All these several prices have been paid. Upon receipt of the news of the stoppage of the wells, refined oil in Montreal advanced 10c. per gallon at once and still has a rising tendency, as the supply for the month to come will fall far short of the amount manufactured the past one; besides, the stock of both crude and refined in Europe is very light indeed, comparatively.

"Several new wells are in process of drilling; what their future influence may be upon oil matters remains to be seen. We cannot anticipate."

ORGANIC MATTER IN DRINKING WATER.—At a late meeting of the London Chemical Society Dr. Woods read a paper on the character of the water which should be used for drinking and domestic purposes. He insisted that organic matter in water was injurious to health, and it was as much the duty of a physician to prevent as to cure disease. He stated that his attention was pointedly directed to this subject by the case of two French ships that had been despatched simultaneously with troops from Algiers to France, and under similar circumstances excepting the water with which they had been furnished. The water of one was obtained from a marshy place where the ague was prevalent; that of the other from an elevated position where the ague did not prevail. Soon after sailing, the troops on board of the vessel supplied with water from the marsh spring were seized with remittent fever, while not a case occurred on board of the other vessel. Dr. A. Smee, who was present, stated as his opinion that as a rule all animal excreta in water should be considered poisonous to animals of the same class, and all organic matter of a decomposable character in water was highly prejudicial to health. He believed that the best water to send to sea was that derived from deep springs in the chalk formations.

DUBUQUE, IOWA.—The report of the Key City Gas-light Company of Dubuque, Iowa, will be found in another part of this number of the JOURNAL. This company is in a sound and prosperous condition, and is the only paying gas company in the State of Iowa. The others, either from a too free watering of the stock, or from bad management, or both, are not earning enough to pay regular dividends. The principal part of the stock in this company is held by J. K. Graves, Esq., its secretary, and its present satisfactory condition must be in some measure owing to the efficient superintendence of its officers.

THE ST. NICHOLAS HOTEL GAS-WORKS.—The gas-works at the St. Nicholas Hotel, which were erected by Mr. Thomson of Toronto, C. W., for making gas according to his patent process, having proved a failure, they are now being reconstructed by Mr. D. Parrish, Jr. Mr. Parrish altered the gas-works of the Fifth Avenue Hotel, which have been in successful operation for some time. The gas is made from petroleum tar, and after leaving the gas-holder it is mixed with a sufficient quantity of atmospheric air to ensure its perfect combustion without smoke or smell. The light emitted from the mixed air, is very soft and beautiful, and of a high illuminating power, and has given the greatest satisfaction to the proprietors as well as to the guests of the house.

DAVENPORT, IOWA.—The Gas Company of this place has not much to brag of. The works are mortgaged for $80,000, with $20,000 unpaid interest thereon, besides $60,000 preferred stock, and a large amount of common stock. Unless the holders of the mortgage take things into their own hands, the prospects both for consumers and producers of gas in Davenport are bad.

WARREN, OHIO.—These gas-works were built in 1861 by Mr. D. Parrish, Jr. The capital stock is $30,000 in shares of $50 each. Population of the gas district about 4,000. The price charged for gas is $3.00 per thousand cubic feet. This is a low price for a small town, but being situated near extensive coal mines, the first cost of coal is much less that eastern companies have to pay.

PATENTS.

UNITED STATES

37,427.—R. N. Allen, Cleveland, Ohio, for an Oil Barrel:

I claim the herein-described oil barrel or cask in which the parts are constructed, combined, and arranged in the manner and for the purpose set forth, the same being a new article of manufacture.

37,436.—H. W. Dopp, Buffalo, N. Y., for an Apparatus for Burning Coal Oil for Heating Purposes:

I claim the distributing plate, A, with solid center, a, and generator, B, or their equivalent, so arranged that the vapor shall escape from one or more small orifices into the unconfined atmosphere, and be arrested by means of the solid part of plate A, or its equivalent, for the purpose of causing its combustion after it is thus arrested, sufficient heat being obtained thereby to keep up continuous vaporization, substantially as described.

I also claim the combination of the crank pin and the cam groove to obtain an up-and-down motion of the graduating valve, C, substantially as and for the purpose herein described.

37,442.—Benjamin Garvey, New York City, for a Lamp:

First, I claim incombustible wicks for lamps, formed of the materials and in the manner substantially as described in the accompanying specification.

Second, I claim the application to lamps of tubes of glass, glazed pottery, or other such material, which is a bad conductor of heat, and is, at the same time, impervious to the fuel, for the purpose of protecting the wick from the cooling effects of external air, and of confining the heat of the flame as far as possible, to the wick, in the manner set forth substantially in the accompanying specification.

Third, I claim wick tubes of any suitable materials in imitation of candles or tapers of wax, spermaceti, paraffine, &c., in the manner described in the accompanying specification.

37,461.—John Scott, Lawrenceville, Pa., for a Car for Carrying Petroleum, &c.:

I claim the employment of a railroad car, A, lined with sheet metal, substantially as herein described for the purpose of carrying on a railroad petroleum or other liquid in the bulk.

And I also claim the arrangement of the partitions, e f, perforated near the bottom with holes, h, in the interior of the car, A, as and for the purpose specified.

37,466.—Richard Stileman, Philadelphia, Pa., for a Hydrant:

I claim the sluice valve, D, with its casing, C C', when combined with and arranged in respect to the stem, A, of a fire-plug as and for the purpose set forth.

37,477.—Abel Thompson, Brooklyn, N. Y., assignor to himself and Daniel Richards, New York City, for Casks and Barrels for Oil:

I claim lining a barrel or cask for petroleum or coal oils with sheet metal, said lining setting against the interior of the barrel or cask for the purpose and as specified.

I claim the metal screw bung hole, c, attached to the cylinder, a, and passing through the staves for the purposes specified.

And I claim the wings, e e, attached to the cylinder, a, and running between the staves for the purposes specified.

I also claim the staves formed as segments of a cylinder, tapering on the outside, and receiving the wooden heads and the hoops to form a barrel or cask as set forth, in combination with an interior lining, whereby said barrel or cask is adapted to contain coal oil, as specified.

37,478.—Darius Wellington (assignor to Cornelius Wellington), Boston, Mass., for a Wash-basin Faucet:

I claim the improved basin faucet, as constructed with the leakage intercepting chamber, a, and its conduit, b, arranged within the standard, A, and with respect to the joint of the movable nozzle, B, and the plug, c, substantially as specified.

And in combination with the leakage intercepting chamber, a, and its outlet, b, arranged on the stand, A, of the faucet as specified, I claim the auxiliary intercepting chamber, e, or its equivalent, and the conduit, g, or its equivalent in the turning nozzle, B, the whole being arranged to operate together, substantially as and for the purpose or objects as hereinbefore set forth.

37,492.—Clark O. Bush, Michigan Bluff, Cal., for a Water Elevator:

I claim, first, The endless chain of buckets, B, and inclined troughs or conduits, f, in combination with the endless chain of buckets, A, when the latter is operated by the water lifted by the former as specified.

Second, The curb, H, splash boards, c c, and inclined trough or conduit, f, in combination with the endless chain of buckets, A, when arranged to operate in the manner and for the purpose specified.

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THE COMMITTE ON SEWERS OF the Board of Aldermen will meet every WEDNESDAY, at 3 o'clock P. M., in Room No. 8 City Hall. Parties interested in any matter before the Committee will have an opportunity of being heard.

T. FARLEY,
IRA A. ALLEN,
G. A. JEREMIAH,
Committee on Sewers

OFFICE OF THE CITIZENS' GAS-LIGHT COMPANY OF BROOKLYN, No. 1 POST-OFFICE BUILDING, MONTAGUE ST., BROOKLYN, Dec. 29, 1862.—THIRD DIVIDEND.—A dividend of THREE PER CENT. on the capital stock of this Company has been declared, payable on and after the 15th of January. The Transfer Books will be closed from the 1st to the 15th of January inclusive. By order,

H. WARREN, Secretary.

OFFICE WILLIAMSBURGH GAS-Light Company, Brooklyn, N. Y., January 12th, 1863.—DIVIDEND.—The Board of Directors have this day declared a semi-annual DIVIDEND of FIVE PER CENT., payable on and after Monday next, January 19th.

The Transfer books will remain closed until the 20th. C. F. BLODGET, Secretary.

JERSEY CITY WATER LOAN Bonds.—Notice is hereby given that the Interest Coupons, due January 1, 1863, of the Jersey City Water Loan Bonds, will be paid upon presentation at the Ocean Bank, New York city, and the Bank of Jersey City, Jersey City, N. J.

G. S. BOICE, Registrar.

OFFICE OF THE WATER COMMISSIONERS, Jersey City, Dec. 20, 1862.

NEW BOOKS.

BOOKS FOR GAS ENGINEERS.

A Treatise on Gas-Works and the Practice of Manufacturing and Distributing Coal-Gas. By Samuel Hughes, Civil Engineer.

Gas Legislation, being a copious Index to the Metropolis Gas Act of 1860. By Samuel Hughes, C. E.

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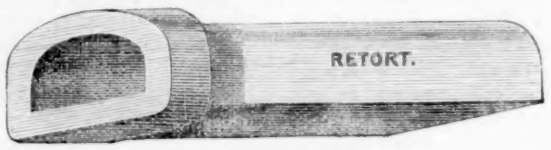

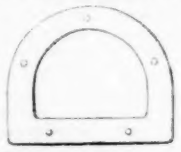

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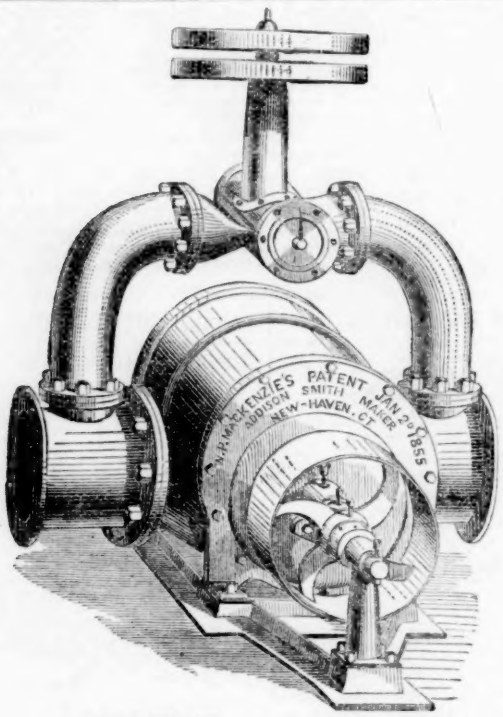

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Iron pipes are at present frequently covered with a coating of bitumen or coal tar before they are laid down; but the adherence of this coating to the metal being very imperfect, on account of vibration and the difference of expansion, this preservation is insufficient, besides being exposed to a number of influences which neutralize its efficacy—galvanic currents materially assist the formation of oxides and deposits, which cause the obstruction and eventually the destruction of metallic pipes.

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The cost of laying the Pipe is also small, compared with those of iron, and can be done by mere laborers. The Bituminized Pipes have been in use the last three years, for the conveyance of gas and have been ascertained to be as perfect now as when first laid down.

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Pack the pipes level in the ordinary way; slip the collar over one of the pipes; draw the ends close together and warm them by putting a hot iron between them; then press them together so as to make them adhere; take a piece of iron wire netting, about half an inch in the mesh, a little narrower than the length of the collar, and long enough to wrap once round the pipe, spread the collar over it and the joining; close the ends with clay; pour the melted cement into the manhole of the collar, and fill up the interior space; then remove the clay and the joint is finished.

It is necessary to leave a small vent hole in the clay at each end of the collar to allow the air to escape as the cement is poured in, that there may be no flaws or air bubles in it when cold. If in cooling the cement settles in the manhole, fill up again.

N. B.—The cement should be broken into small pieces and melted in a pot as you do lead, at a low temperature, until it is dissolved; it must be stirred while melting; then take it off and keep stiring it as it cools until it becomes nearly as liquid as water; then pour quickly.

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These SIGNAL LIGHTS are intended for use on Vessels propelled by Steam, and those exclusively. They specially indicate the presence of a Steamer, and by their use there will be less likelihood of mistakes, and consequent collision, than at present. They are also intended for SIGNALLING AT NIGHT, and can be used for that purpose UNDER ANY CODE of SIGNALS NOW ARRANGED FOR FLAGS.

This Improvement in Lights for Steam Vessels consists in having the Lanterns containing the colored lights connected by means of a series of cogged gearing with some convenient part of the Engine or Machinery, so as to cause them to have a revolving motion around their axis. On side-wheel steamers, the Lanterns should be placed directly over the wheel-houses, and the power, or motion to turn them, may then be very conveniently obtained from the paddle-wheel shaft. On Propellers, the Lanterns should be placed on each side of the Pilot House, or hurricane deck, and the rotary motion derived from any convenient or suitable part of the Engine or Propeller shaft. Each Lantern is supported on the end of movable cranes, so that their relative positions may be changed and properly adjusted to suit the view of observers on either side of the vessel at the time of signalling.

The Lanterns to be used in this improvement may be constructed for Burning Oils, Fluids, Gas, or any of the known modes of illumination, and should be furnished with one or more lenses and reflectors, so as to concentrate the rays of light, and project them over the horizon with the greatest intensity. The lenses for this purpose should be made with colored glass, viz., Red and Green, and the position of the respective Lanterns, according to the color of the lenses therein, must be placed on the sides of the vessel so as to answer to the requirements of Rules and Regulations made and published by the Supervising Inspectors of Steamboats, agreeably to the Act of Congress of the United States in such cases made and provided. That is to say—by said Regulation—the Lantern having the green lenses for producing the Green Colored Light, must be placed on the starboard side of the vessel, and the other Lantern producing the Red Light, to be placed on the port side thereof. In pursuance, also, of the aforesaid Rules and Regulations, there is to be found in board and behind each Lantern, a screen to answer the purposes therein mentioned.

The cogged gearing, by which the Lanterns are connected with the Engine or paddle-wheel shaft, and thereby caused to revolve when the Engine is in motion, is so arranged that the connection may be readily shipped or unshipped, and the Lanterns made stationary or otherwise, at the pleasure of the Pilot, or those whose duty it may be to operate and attend to the same. The cranes on which the Lanterns are placed are also rigged so as to be readily turned horizontally from one position to another, so as to present one or both lights to the view of observers when laying athwart ships at the time of signalling.

On the Use and Application of the Improvement for Night Signals.

When the vessel is under weigh, or going ahead in its course, the Lanterns are to be placed directly athwart ships, so that such colored light therein will then have the position and place prescribed by Rule Seventh of the aforesaid Supervising Inspectors of Steam Boats, and with the screens behind them, as above described, will then answer all the intents and purposes for which the colored lights are thus required to be used, as illustrated in the several diagrams published by said Inspectors for the working of a system of Colored Lights. The Lights in this case, according to the color seen by the observer, indicate the course or direction of the vessel whereon they are carried. When the Lanterns with the colored lights therein, are made to revolve around on their axis, as proposed in this improvement, in addition to the signal above, another, and as we believe, very important and useful signal is thus formed, indicating that the vessel, whereon it is carried is a Steamer. In dark foggy nights, it is found by experience, to be somewhat of a difficult task to distinguish sailing vessels from Steamers and Propellers, especially when the latter are rigged, and carry a press of sail. When Steamers meet "head and head," it is the duty of each to pass to the right, or, on the larboard side of the other. Whereas, when a Steamer meets a sailing vessel, the former must give way and allow the latter to pursue its course. Hence, to carry out the regulations of the said Steamboat Inspectors, and prevent collisions, it is important to have some infallible sign, whereby the character of the vessel may be readily seen and determined. Several very fatal collisions have recently taken place through mistakes of this kind.

On Signals for Speed and Distance.

The gearing of the Lanterns with the paddle wheel or propeller shaft, may be so arranged as to be an index of their speed. A very good proportion, would probably be to make the Laterns turn about one third as fast as said shaft. Hence, when the speed of the vessel is previously known, when making a certain number of revolutions of the paddle or propeller, it becomes an easy task from observing the time with which the Lanterns thereon may be turning to approximate to the speed with which the said vessel is moving at the time of observation. Again, as the arcs described by the rays of light from each lantern, as they revolve around on their axis, is greater in proportion to the distance from said lantern, so will the time in which said rays move over any given space, be less in the same proportion. Hence, when the lights are very remote, or far off, from the observer, the duration of each column or cylinder, of rays from each lense, would pass the eye of the observer, in a short space of time, or with great velocity. Whereas, at a nearer point of observation, the time of its passage would be considerably lengthened, or the motion thereof apparently much slower. From these facts, we believe the improvement is susceptible of indicating, in an approximate manner, the speed and distance of vessels whereon the revolving lights may be used.

On the Application of the Improvement for Marine Telegraphic Purposes.

The Revolving Lights can be readily applied to the general purposes of Marine Signalling at night, as follows: In order to show this application, we have adopted the Numbers as given in Roger's Code of Marine Day Signals, believing that work to be somewhat of a standard in matters of this kind. Instead of the flags used in the above code, for day signals, to indicate the combinations of two or more letters of the Alphabet, which combination is referable to certain numbers indicative of the words or sentences telegraphed, we propose to perform the same operation, at night, by means of the two revolving colored lights, so as to indicate the numbers directly to which the intended words or sentences to be telegraphed are referable. Thus, whether the vessel to be signalled is ahead, astern, or abaft the beam, the position of the two colored lights must be so adjusted, by means of the moveable cranes, whereon said lanterns or lights are fixed, that the two lights may be fully made visible to the observer. When both lights are thrown into this position, stopping the motion of the lanterns may be the signal for calling attention, or a rocket fired off, or the steam whistle blown, would answer the same purpose. Now, in order to represent the ten numerals, we propose to indicate them by the respective motions of the two colored lights, as follows:

RED LIGHT.	GREEN LIGHT.
One Red, Represents Number 1.	Two Green, Represents Number 2.
Three do. do. do. 3.	Four do. do. do. 4.
Five do. do. do. 5.	Six do. do do. 6.
Seven do. do. do. 7.	Eight do. do. do. 8.
Nine do. do. do. 9.	One do. do. do. 0.

In the above arrangement, it will be seen that all the odd numbers are made by the Red Light, and the even numbers by the Green Light. In order to indicate the repeat of the last number, once or more times, or for other special purposes, which may hereafter be found useful and necessary, an even number of lights may be shown by the Red, and an odd number by the Green. It will be understood that when the Lanterns are made with three lenses in them, the numerals as above arranged are formed by the number of times a new light or lense is presented to the observer. Thus to indicate the number 3, the Red Light or Lantern would make one entire revolution; and to make the number 6, the Lantern carrying the Green Light would make two revolutions, and so on with the other numbers. When a symbol is made, the motion of the Lantern is to be suspended for a short time, and when a number expressing a sentence is formed, the lantern may be stopped for a longer period, or some one of the special signals above referred to, may be used for this purpose.

To show the application of this improvement as above mentioned, whereby these Lights can be used as readily for Night Signals, as Flags are used for Day Signals by the author of Roger's Code, we shall use the sign O colored red or green, according to the light used, to show the number of movements performed by the respective lights in order to represent any desired number of said code, suitable for the required purpose.

RED LIGHT.	GREEN LIGHT.
O, O, O, O, O,	
O, O, O, O, O, O, O.	
	O, O.
	O. O.

The above would represent the number 5722, and by reference to said Roger's Code, would be found to stand before the sentence:

"WILL YOU SHOW THE NUMBER THAT REPRESENTS YOUR NAME?"

RED LIGHT.	GREEN LIGHT.
O.	
O, O, O, O, O.	
O, O, O, O, O, O, O.	
	O, O.

Here the number expressed is 1572, and per the same Code, stands for

"WHERE ARE YOU BOUND?"

RED LIGHT.	GREEN LIGHT.
O.	
O, O, O, O, O, O, O, O, O.	
	O, O.
O, O, O, O, O, O, O, O, O.	

The number thus expressed is 1928, and per said Code is

"WHAT IS YOUR CARGO?"

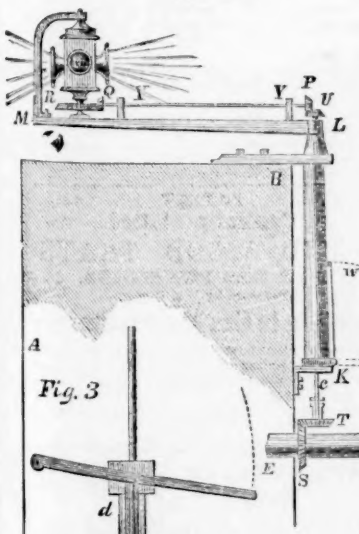
RED LIGHT.	GREEN LIGHT.
O, O, O, O, O.	
	O, O, O, O, O, O.
	O.
O, O, O.	

Here the number expressed is 5603, and stands for

"HAVE YOU ANY NEWS?"

(RED LIGHT.)

Fig. 2



(GREEN LIGHT)

Fig. 1

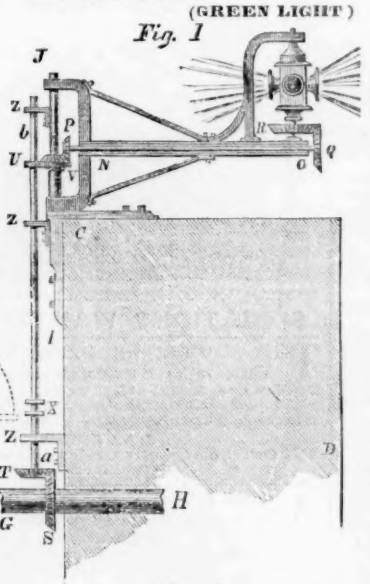


Fig. 3

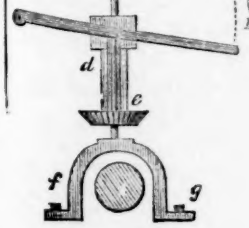


Fig. 4

MECHANICAL CONSTRUCTION.

In our engravings, Figs. 1 and 2, represent Vertical Sections through the wheel-house. In them E F and G H represent portions of the main Shaft. In Fig. 1, I J is a stout Iron or Wooden post, fastened against the side of the wheel-house, directly over the main shaft. On the upper part of this post, is fitted the moveable arm or crane N O, to the main shaft is fitted the bevel wheel S, and to the lower end of the rod a b, is fitted a corresponding wheel T. U is a small pinion on a b, which gears with the spur wheel, V, which in turns gives motion to the wheels, P and Q, and so revolves the lamp R. It will be seen that a Rotary motion is given to the lamp, when the main shaft is in motion and a b connected.

It can be disconnected by a lever, acting between the bosses X, which will elevate the rod in the guides Z Z Z.

Fig. 2 is another arrangement, for the same purpose. In this, K L represent a hollow Shaft, on which is firmly fastened, the arm L M, on which is the lantern. The hollow post is secured to the wheel-house by the straps K and B, and it can turn freely in them, the other part being the same in them as in fig. 1

The lever K W, when drawn down, will turn the frame in any required position around the Shaft c U. In fig. 1, the arm or crane N O, may be operated by cords from the wheel house, but in this device, the rod c U, does not lift up as in fig. 1, but in its place, the lower end is made square, and on it slides the short tube, d E, shown in fig. 3. The lower end of the rod turns on a bridge, f g, spanning the main shaft. On the upper end of the tube, d e, a lever is attached by means of boxes and collars as shown in fig. 4. This lever when raised carries with it the beveled wheel T, thus disconnecting the gearing apparatus.

ALBERT POTTS, Patentee,
PHILADELPHIA, Pa.

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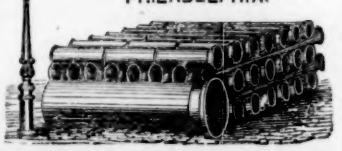

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